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A
COURSE
OF
Practical Chemiſtry.

In which are contained

All the OPERATIONS

Deſcribed in

WILSON's *Complete Courſe of Chemiſtry.*

WITH

Many new, and ſeveral uncommon Proceſſes.

To *each* ARTICLE is given,

The CHEMICAL HISTORY, and
to *moſt*, an Account of the Quantities of OILS,
SALTS, SPIRITS, yielded in Diſtillation, *&c.*

FROM

Lemery, *Hoffman*, the *French* Memoirs, *Philoſophical*
Tranſactions, *&c.* and from the Author's own Experience.

With COPPER PLATES.

By WILLIAM LEWIS, *M.B.* R.S.S.

LONDON:

Printed for J. NOURSE, at the *Lamb*,
againſt *Katherine-ſtreet*, in the *Strand.*

M.DCC.XLVI.

WELLCOME
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TO

Sir *Hugh Smithſon*, Bart.

Member of Parliament.

SIR,

PART of the work which I now take the liberty of preſenting, was introduced to the public under the patronage of the right honourable the Earl of Yarmouth, a nobleman, among other great talents, extremely well verſed in the art of chemiſtry. You, Sir, well know, how effectually this art may be applied to the promoting of uſeful knowledge, and that it is by no means confined within the narrow bounds of pharmacy; and are a perfect judge, whether the additions which I have made to the original work, tend to this laudable end.

Several of the experiments, the reſult of which is occaſionally interſperſed, you have done me the honour to be preſent at the making of; and ſome of the moſt extraordinary facts are owing to hints which you was pleaſed to give me.

Permit me therefore, Sir, to hope, that this offering will meet with a favourable acceptance from your hands; and that your known candour will excuſe ſuch imperfections, as your skill in theſe matters may diſcover; ſince the chief end of this undertaking is to advance uſeful knowledge, the encouragement of which, amongſt other qualifications, diſtinguiſhes the truly great.

I am, Sir,

With perfect reſpect,

Your moſt obedient,

And obliged,

Humble Servant,

Dover-Street,
May 2, 1746.

William Lewis.

upon it, as have been either furniſhed by other authors, or made by ourſelves.

3. *Several new and commodious inſtruments.*

4. *Certain facile methods of expediting ſeveral proceſſes.*

5. *Plain and full directions for performing ſuch operations, as are either difficult or dangerous, with proper cautions.*

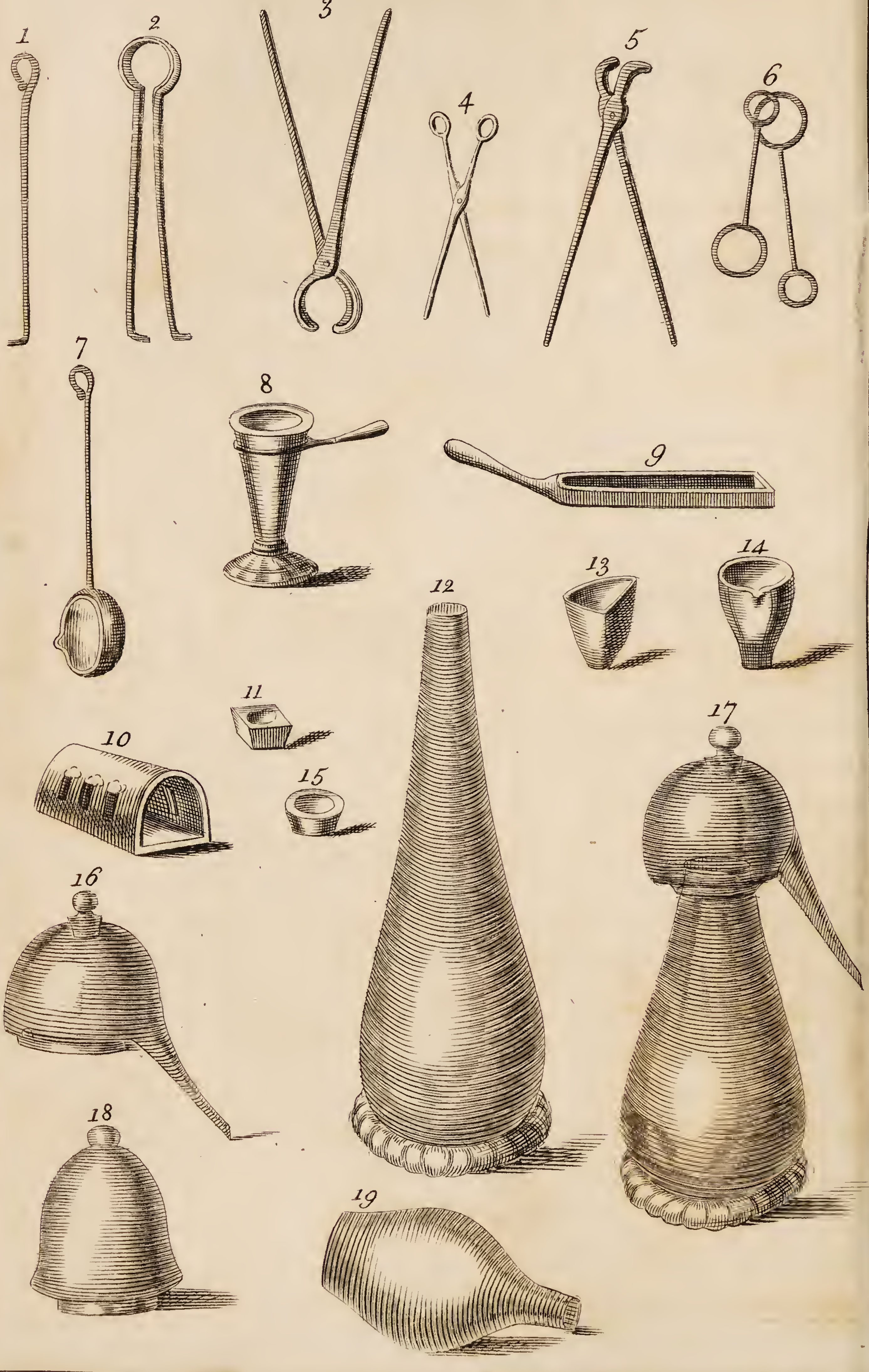
6. *Several new and uncommon proceſſes, and entire chapters diſtinguiſhed by inverted comma's.* [“ ”]

7. *An account of the quantity of oil, ſalt, ſpirit, yielded in diſtillation,* &c.

8. *Some hints for the improvement of certain trades.*

9. *A copious index.*

Pl. 1.



AN
EXPLANATION
OF THE
FIRST PLATE.

1 *AN iron hook, to clear the grate with.*
2
3 *Several ſorts of tongs.*
4
5
6 *Iron rings to break glaſſes with.*
7 *An iron ladle.*
8 *A melters cone, or antimonial horn.*
9 *An ingot-mould.*
10 *A muffle.*
11 *A Cupel, or coppel.*
12 *An uncut body.*
13 *A German crucible.*
14 *A black-lead crucible.*
15 *A Cupel, or coppel.*
16 *An alembic head.*
17 *A body and head.*
18 *A blind head.*
19 *An earthen long-neck, or veſſel for diſtilling oil of vitriol, &c.*

AN
EXPLANATION
OF THE
SECOND PLATE.

1 *A retort.*

2 *A Pelican, or circulatory veſſel.*

3 *A crooked glaſs pipe, for conveying liquors into a retort.*

4 *A tubulated retort.*

5 *A receiver.*

6 *A roundle for ſetting glaſſes on.*

7 *A recipient with two pipes.*

  a. *Its ſtand.*

  b. *Its ſmall receiver.*

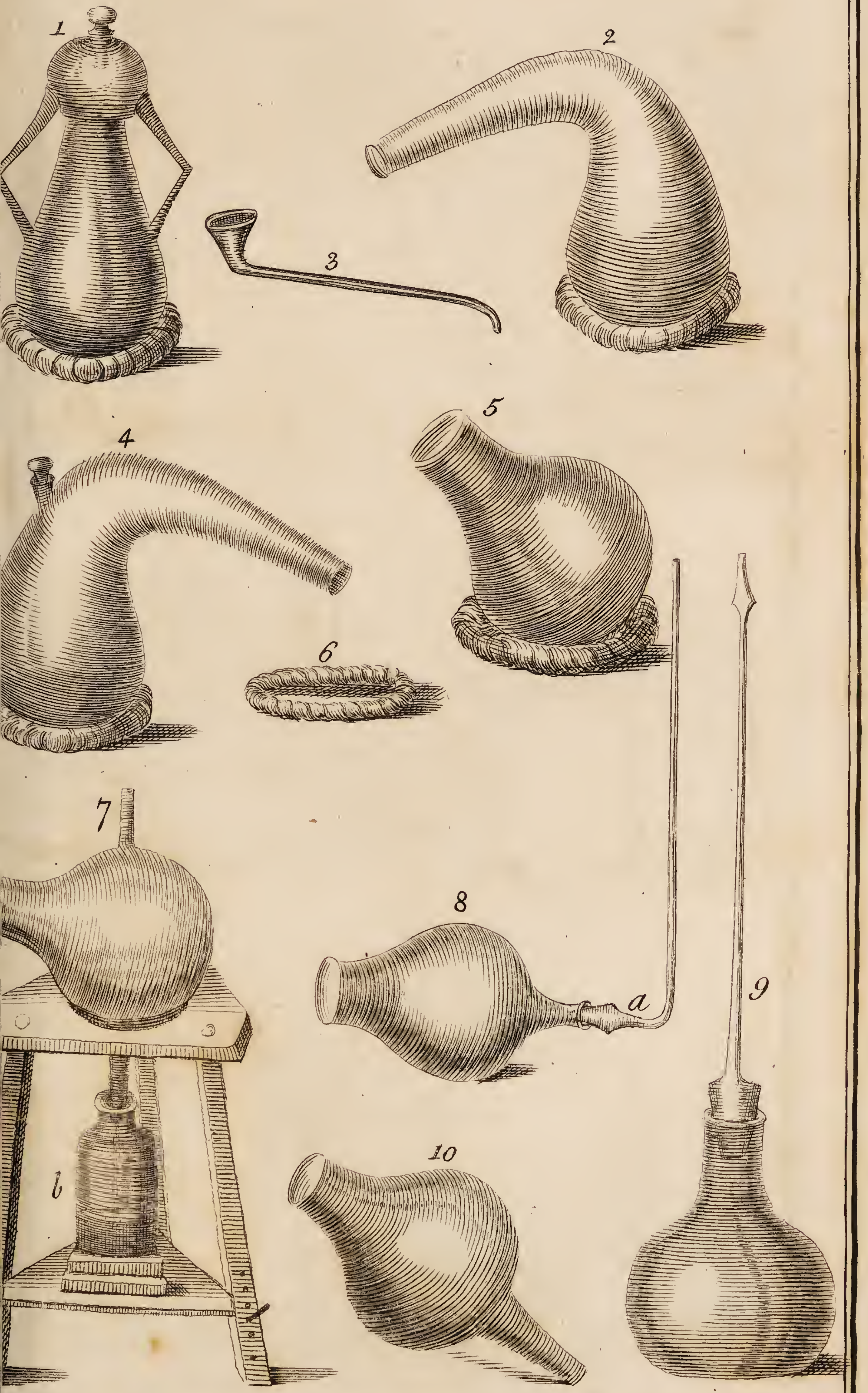
8 *An adopter.*

  a. *A glaſs vent-tube fitted into its ſmall end.*

9 *A receiver with a glaſs pipe adjuſted to it, to make a veſſel for digeſtion.*

10 *An adopter.*

2.



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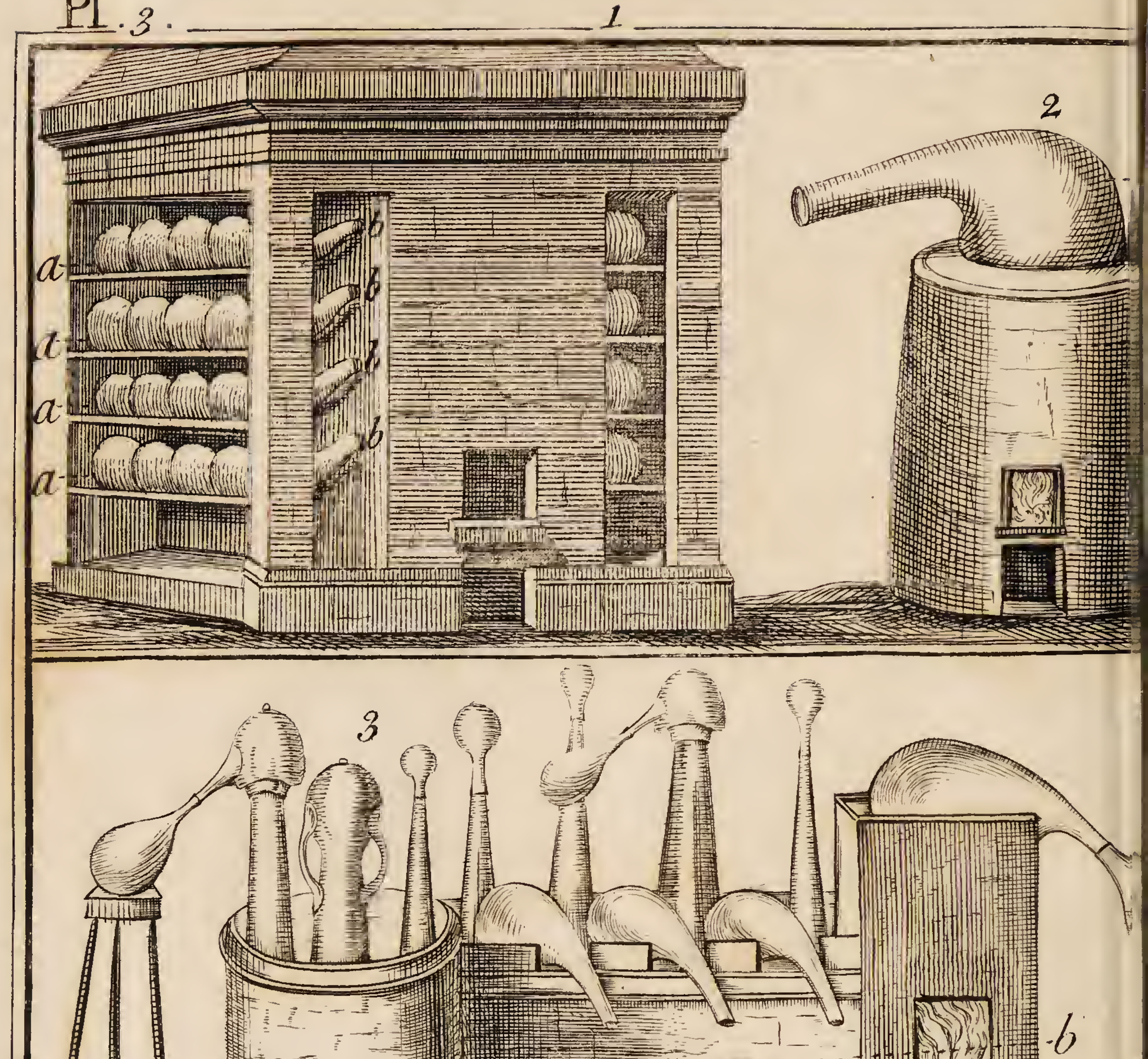


AN
EXPLANATION
OF THE
THIRD PLATE.

1 *A Reverberatory furnace for diſtilling with thirty-two long-necks.*

a, a, a, a. *The receivers.*

b, b, b, b. *The necks of the long-necks, the bodies being placed within the furnace.*

A furnace for diſtilling hartſhorn in quantity.

a. *An earthen head.*

b. *The body of the furnace containing an iron pot.*

A digeſting furnace.

a. *A balneum at the end of the furnace.*

b. *The ſand bath.*

The balneum mariæ.

A melting furnace.

a, b. *Two ſmall doors to the fire-place, to be opened occaſionally, when it is neceſſary to inſpect the matter acted on by the fire, or to add fuel.*

c. *A large door, to be opened when a crucible is to be ſet in or taken out of the furnace.*

AN

EXPLANATION

OF THE

FOURTH PLATE.

1 *A Large furnace, in which flowers of ſulphur are ſublimed in great quantity.*

- a. *The fire-place.*
- b. *The aſh-hole.*
- c. *The door into the body of the furnace, by which the flowers are taken out.*

2 *A ſmall furnace, in which flowers of ſulphur are ſublimed in ſmall quantity.*

- a, a. *Two receivers.*
- b. *The head, made of earth or iron.*
- c. *The veſſel, which contains the ſulphur in the furnace.*

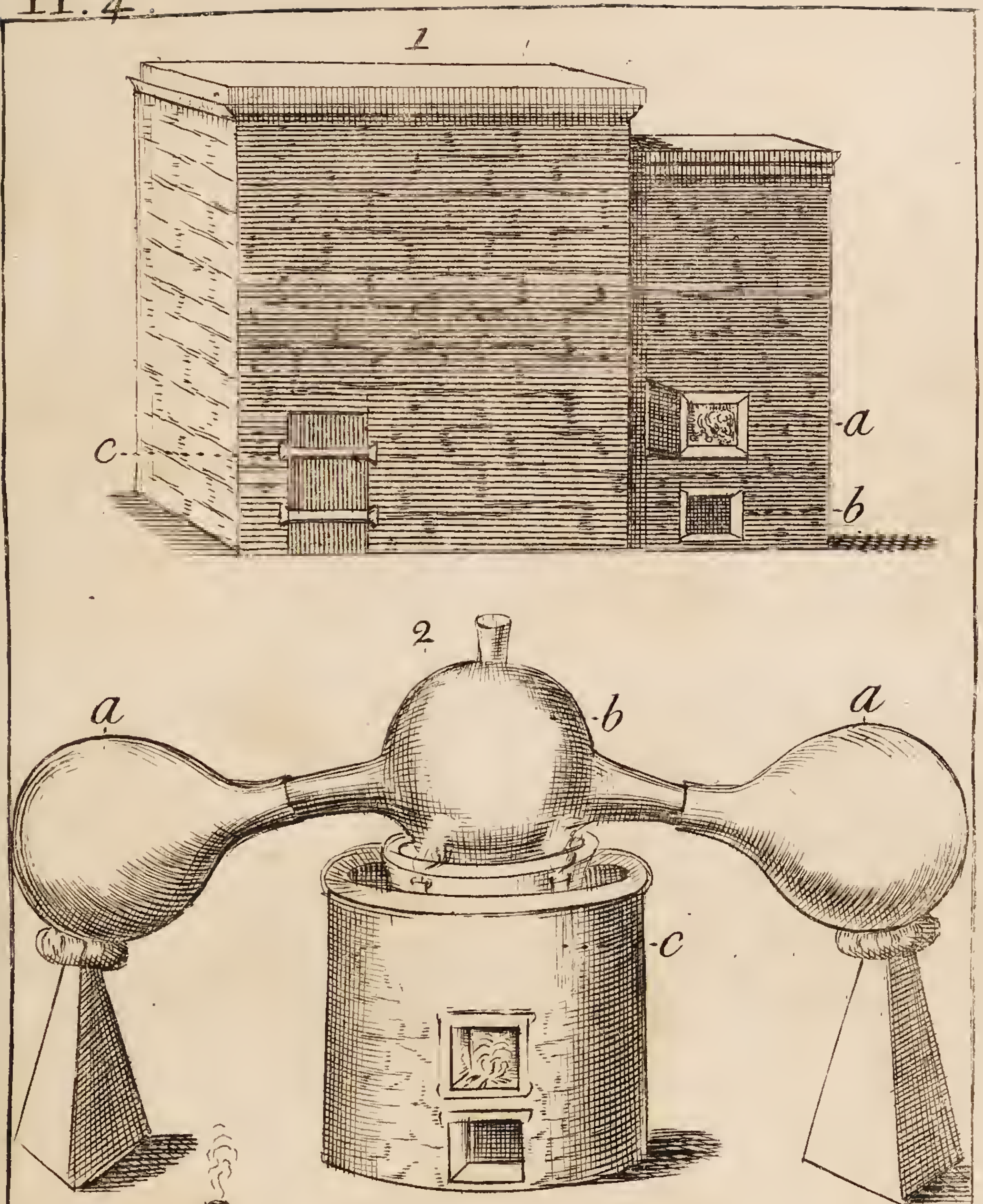
3 *A plain glaſs bell, for making ſpirit of ſulphur.*

- a. *A veſſel containing burning ſulphur.*
- b. *The receiver.*

4 *A more commodious apparatus for making ſpirit of ſulphur.*

- a. *A large retort, with a hole in its bottom.*
- f. *A tubulated receiver, with the ſpout upwards.*
- e. *A glaſs mortar.*
- d. *A concave glaſs plate, with a hole in the middle.*
- c. *A gallipot inverted over the perforation in* d.
- b. *A crucible containing burning ſulphur.*

Pl. 4.



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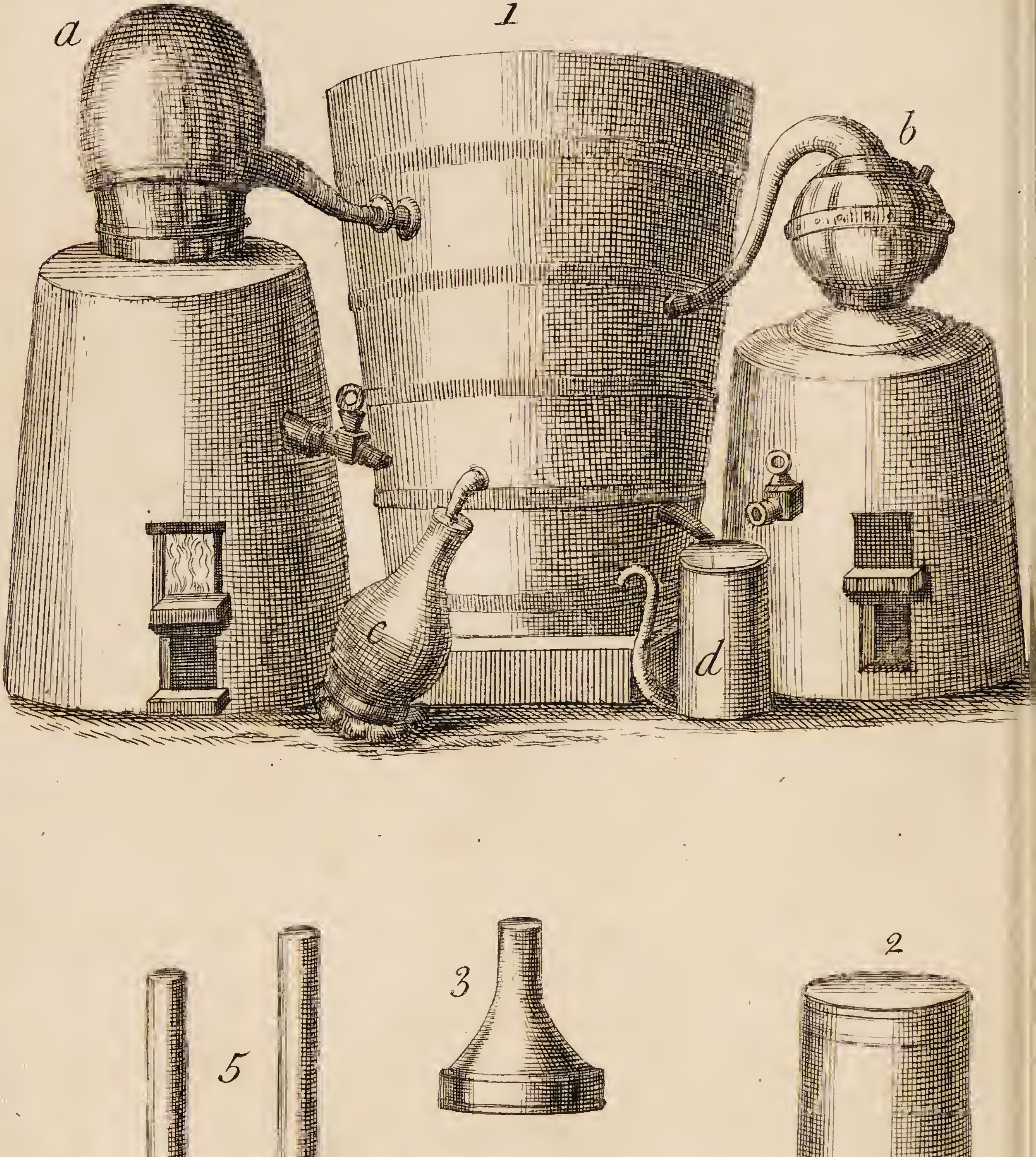


AN

EXPLANATION

OF THE

FIFTH PLATE.

1 TWO *ſtills at work with one common refrigeratory.*

- a. *A large ſtill, with an alembic head, for diſtilling oils.*
- d. *A ſpout-receiver, for ſeparating the oil from the water.*
- b. *A leſſer ſtill, with a ſwan-neck, for diſtilling compound waters,* &c.
- c. *Its recipient.*

2 *A pewter veſſel, to be placed in the great ſtill.*

3 *A breaſt to it.*

4 *Its head and refrigeratory.*

5 *Two copper pipes for raiſing the head, in diſtilling alcohol, and highly rectified ſpirits.*

AN

EXPLANATION

OF THE

SIXTH PLATE.

1 A *Subliming furnace,*

d. *The body of the furnace.*

c. *The body into which the matter to be ſublimed is projected.*

b, b, b. *Three aludels.*

a. *The head of the aludels.*

2 *Another ſubliming furnace.*

a. *The body of the furnace.*

b, b. *The covers of the top of the furnace.*

c, c. *The aludels, to which more receivers may be adapted.*

3 *A furnace, for making mercury ſublimate in quantity.*

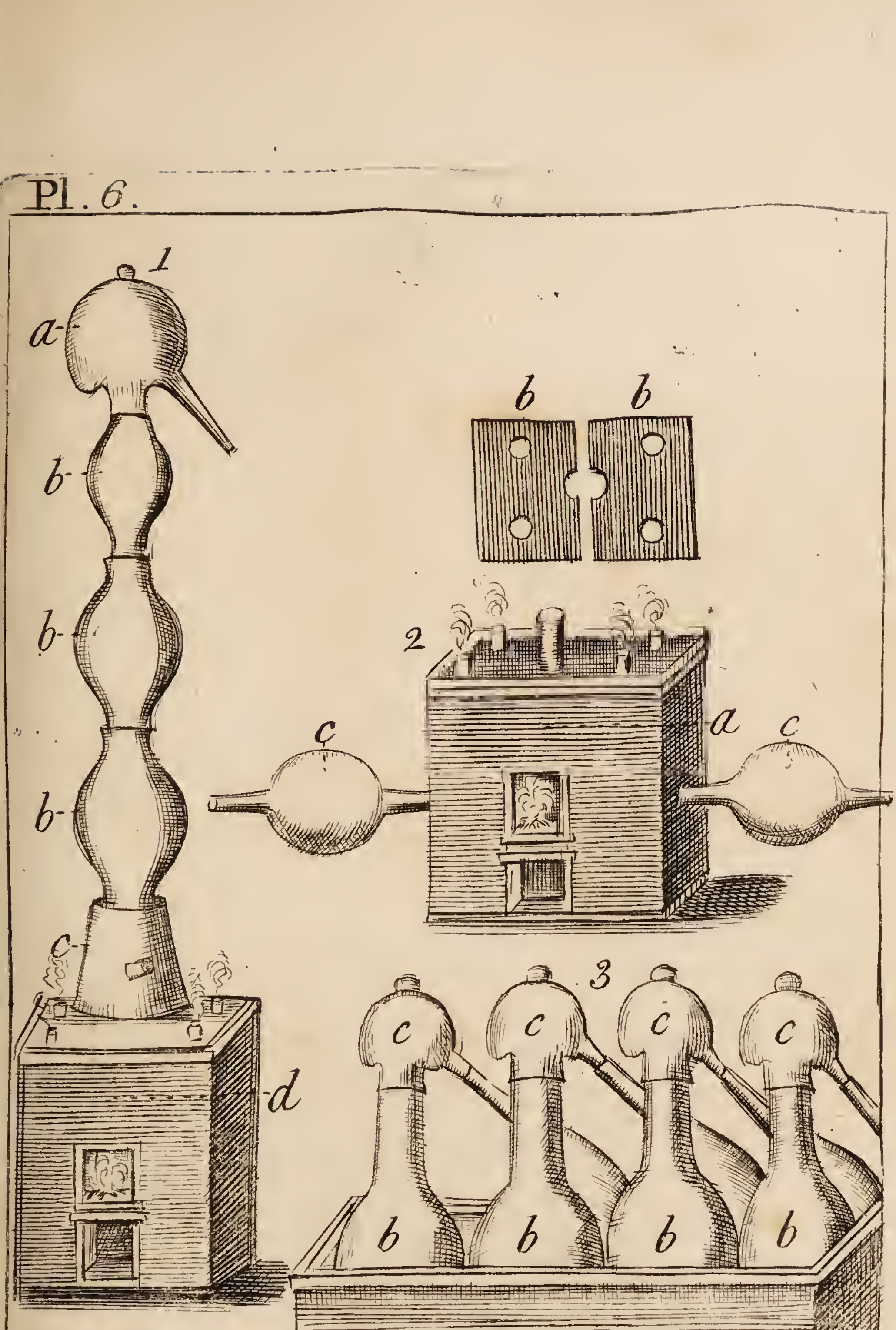
a. *The body of the furnace.*

b, b, b, b. *The ſubliming veſſels ſet in the furnace.*

c, c, c, c. *The heads of the veſſels.*

4 *A ſubliming veſſel out of the furnace.*

Pl. 6.



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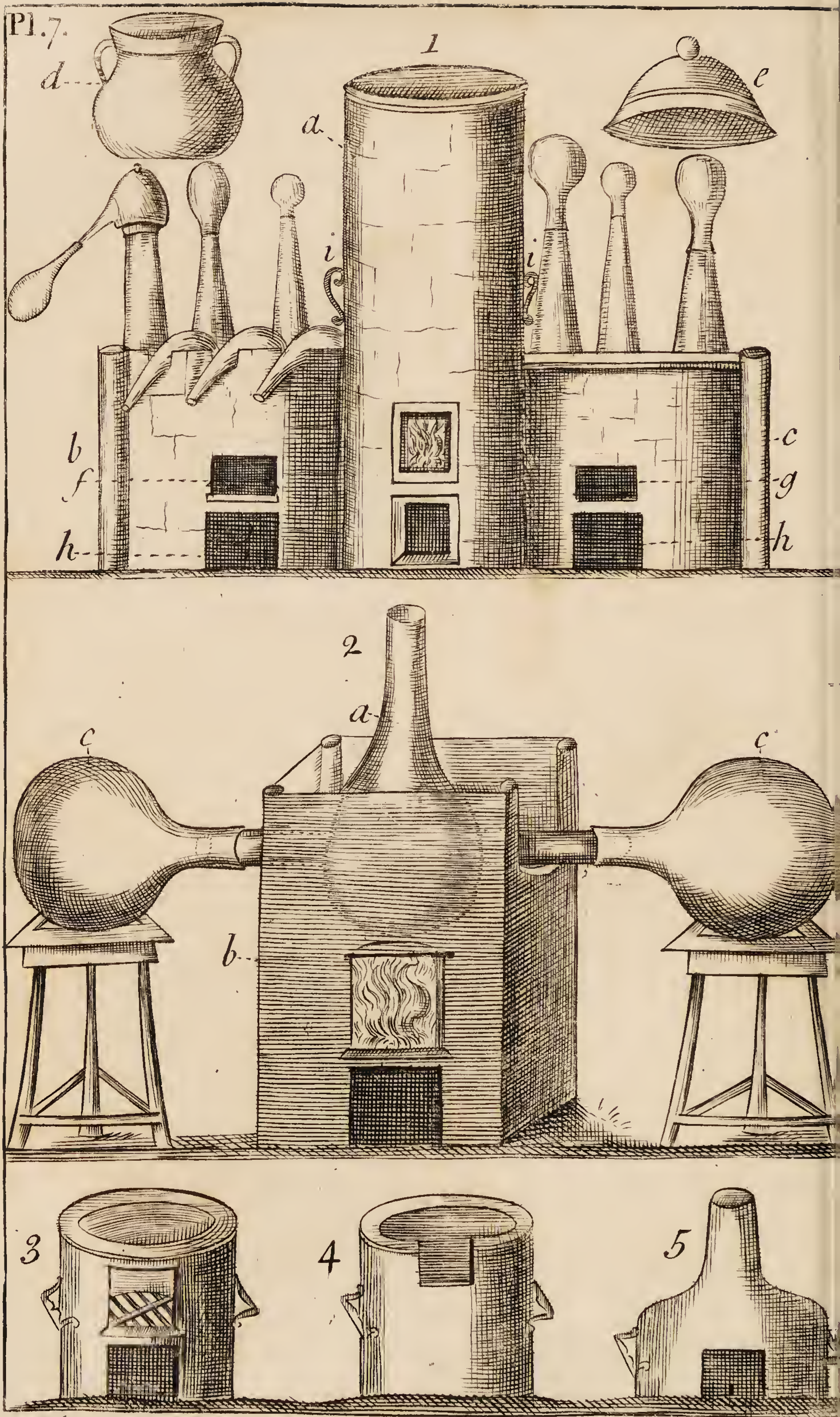


An Explanation *of the* SEVENTH PLATE.

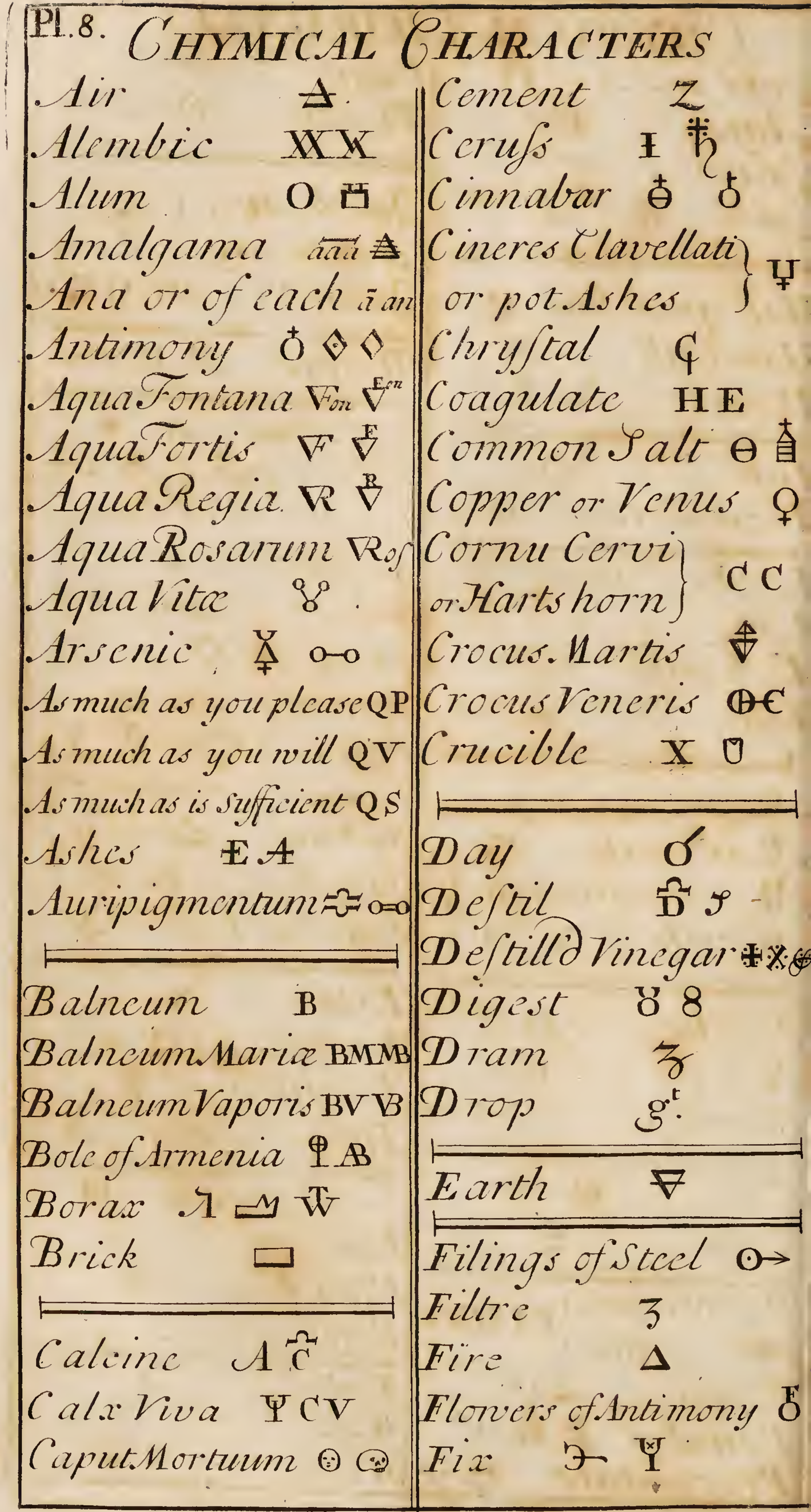
1 AN *athanor furnace.*
a. *The tower.*
b. *The dry bath.*
c. *The moiſt bath.*
d. *A little pot to place on the top of the tower.*
e. *The cover of the tower when the pot is removed.*
f, g. *Holes, by which you may cleanſe the flue, when there is occaſion.*
h, h. *Ovens, wherein you may bake, in which you may alſo hatch chickens.*
i, i. *Handles of regiſters.*

The furnace called an athanor was invented to keep a conſtant heat, even to twelve months, or longer, as ſome chemical operations require; which may be augmented or decreaſed by raiſing or letting down the regiſters, as you pleaſe, and according to the magnitude of the tower: it requires no attendance above once in twenty-four, or one hundred hours.

2 *A furnace, to diſtill any combuſtible compoſition of nitre, ſulphur, antimony, &c. by projecting a little at a time into* a, *and preſently ſtopping the orifice with a fit ſtopple.*
a. *The neck of the veſſel, which contains the matter you deſign to diſtill or ſublime.*
b. *The body of the furnace*
c, c. *The ballons or receivers.*
3, 4, 5. *A portable furnace, eaſily removed, in which you may melt, or diſtill in balneo, ſand, or naked fire. The outſide of the furnace may be made of copper or iron, and it may be lined with a lute or fire-ſtone.*
3 *The lower part of the furnace from the aſh-hole, to the upper part of the fire-hole.*
4 *The middle part of the furnace, which contains the veſſel.*
5 *The dome, or upper part of the furnace.*

Pl. 8.

CHYMICAL CHARACTERS

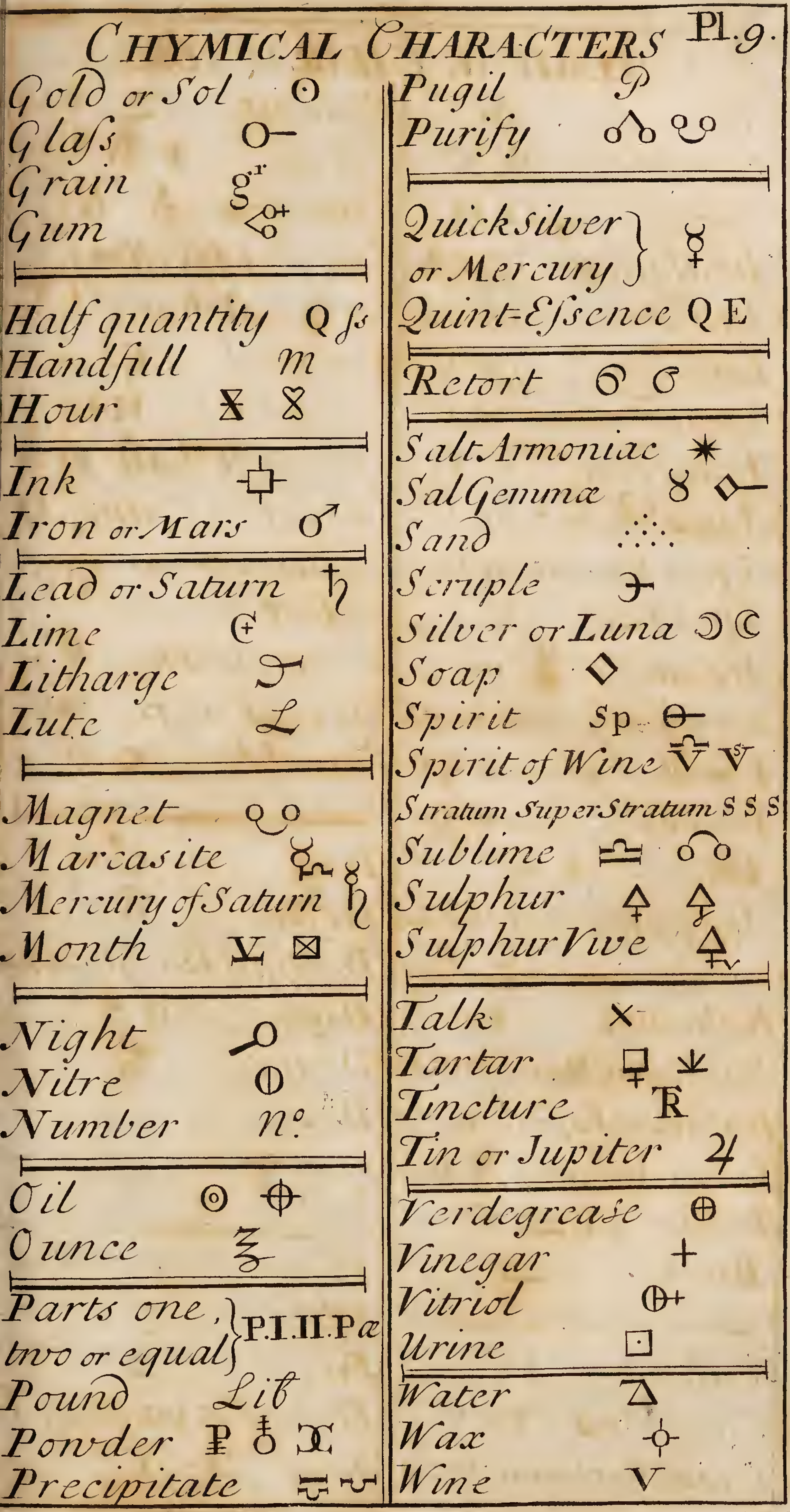


Air	🜁
Alembic	XX X
Alum	O ⊟
Amalgama	aaa 🜁
Ana or of each	ā an
Antimony	♁ ◈ ◇
Aqua Fontana	∇Fon ∇Fon
Aqua Fortis	∇F 🜅
Aqua Regia	∇R 🜆
Aqua Rosarum	∇Roſ
Aqua Vitæ	🜇
Arsenic	🜺 o–o
As much as you please	QP
As much as you will	QV
As much as is sufficient	QS
Ashes	Ŧ A
Auripigmentum	⚌ o=o
Balneum	B
Balneum Mariæ	BM MB
Balneum Vaporis	BV VB
Bole of Armenia	♀ AB
Borax	Λ ⊔ Ψ
Brick	▭
Calcine	A C
Calx Viva	Ψ CV
Caput Mortuum	☉ ☠

Cement	Z
Ceruſs	I ♄
Cinnabar	🜍 ♁
Cineres Clavellati or pot Ashes	♆
Chryſtal	Ϛ
Coagulate	HE
Common Salt	⊖ 🜔
Copper or Venus	♀
Cornu Cervi or Harts horn	CC
Crocus Martis	🜉
Crocus Veneris	⊕C
Crucible	X ᗜ
Day	☌
Deſtil	D ʃ
Deſtill'd Vinegar	✠ ✕ ⊕
Digest	♉ 8
Dram	ʒ
Drop	gt.
Earth	🜃
Filings of Steel	⊙→
Filtre	ʒ
Fire	🜂
Flowers of Antimony	♁F
Fix	϶ Y

CHYMICAL CHARACTERS

Pl. 9.



Gold or Sol	☉
Glaſs	O–
Grain	g^{r}
Gum	⊲o+
Half quantity	Q ſs
Handfull	m
Hour	⧗ ⧖
Ink	⊞
Iron or Mars	♂
Lead or Saturn	♄
Lime	Ȼ
Litharge	Ƨ
Lute	ℒ
Magnet	♌
Marcasite	☿⌐
Mercury of Saturn	☿♄
Month	Ɏ ⊠
Night	⚲
Nitre	⦶
Number	nº
Oil	◎ ⌖
Ounce	℥
Parts one, two or equal	P.I. II. Pæ
Pound	Lib
Powder	₽ ♁ Ӿ
Precipitate	⍖ ⏖
Pugil	𝒫
Purify	ꝏ ꝏ
Quickſilver or Mercury	☿
Quint-Eſsence	QE
Retort	σ σ
Salt Armoniac	✷
Sal Gemmæ	♉ ◇–
Sand	∴
Scruple	℈
Silver or Luna	☽ ☾
Soap	◇
Spirit	Sp ⊖
Spirit of Wine	∇ V^{s}
Stratum Super Stratum	S S S
Sublime	♎ ꝏ
Sulphur	🜍 🜍
Sulphur Vive	🜍
Talk	×
Tartar	⍰ ⚶
Tincture	Ꞧ
Tin or Jupiter	♃
Verdegrease	⊕
Vinegar	+
Vitriol	⦶+
Urine	⊡
Water	▽
Wax	⌖
Wine	V

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A COMPLETE COURSE OF CHEMISTRY.

Of LUTES.

To defend a glaſs in a naked fire.

TAKE *Yarmouth* ſand [a], ſcoria of iron, tobacco-pipe clay, of each one pound; glaſs and fixed nitre [b], of each four ounces; of coarſe tow, cut ſhort, half a pound: diſſolve the tobacco-pipe clay in water, and beat the glaſs and ſcales of iron to fine powder; then mix all together: beat and work this mixture well, till it becomes a ſtiff paſte: ſpread it upon the retort with a knife, the thickneſs of a half crown, to the middle of the neck of it: let it dry gently, after which you may uſe it.

With

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[a] Any river, or other ſand, well waſhed, will ſerve.

[b] Common pot-aſhes are as good.

WITH this lute you may faſten the receivers in the diſtillation of corroſive ſpirits, *viz.* oil of vitriol, ſpirit of nitre, ſpirit of common ſalt, alum, aqua fortis, aqua regis, *&c.* [c].

To lute Alembics.

TAKE ſtarch, glue, flower and water boiled, or flower and water well beaten together; any of theſe ſpread upon ſlips of paper will ſerve: but when you diſtill ſpirit of verdegris, vinegar, tartar, guiacum, box, ſtrong ſpirit of wine, ſpirit of ſal armoniac, or rectify ſpirit of harts-horn, *&c.* you may uſe ſlips of bladder or parchment, dipt in equal parts of flower and ſlaked lime, beaten into the conſiſtence of a ſyrup with the glair or white of an egg [d].

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[c] Tobacco-pipe clay, mixed up with as much river or well waſhed ſand as will prevent its ſticking to the fingers, is equally as good a lute as this for covering glaſſes, which are to be expoſed to the immediate action of the fire. *Windſor* loam, moiſtened with a ſolution of any fixed alcaline ſalt, and then beat up with a ſmall quantity of horſe-dung, is an excellent lute for cloſing the junctures of veſſels in the diſtilling of acid ſpirits. The uſe of the alcaline ſalts is to arreſt the acid ſpirits which penetrate the luting, and to prevent their eſcape. In diſtilling ſpirits from animals, the veſſels are commodiouſly joined with a lute made of three parts *Windſor* loam, one unwaſhed colcothar of vitriol, and as much horſe-dung.

[d] The cakes which remain after the oil is preſſed from linſeed, being ground into a fine flower, and mixed up with a ſufficient quantity of water, make an excellent luting for all the purpoſes mentioned

To fortify cracked glaſſes.

TAKE the ſcrapings of hard *Suffolk* cheeſe, and quick-lime, of each a like quantity: beat them well together; then add as much of the white of an egg as will make the whole of the thickneſs of a ſyrup: dip linnen rags in this mixture, and lay them preſently upon the crack. Remember you mix no more at a time than you uſe in the ſpace of a minute.

To ſeal a glaſs hermetically, is to heat the mouth of the glaſs gradually, till it is red hot and pliable; which you may do, either with ſuch a lamp as the gold-ſmiths uſe to ſolder with, or by a clear charcoal fire; and with a pair of pincers (being alſo red-hot) nip it up ſo cloſe that no air can paſs in or out.

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mentioned in this article. It may be either ſpread upon ſlips of paper, or made into a ſtiff paſte, and applied to the junctures of the veſſels.

Windſor loam, or any kind of clay mixed with as much ſand as it will bear, will ſerve for lining portable furnaces. The refiners line their wind-holes with a luting made of *Sturbridge* clay and broken glaſs-houſe pots, which bears the fire well without cracking or running, if carefully annealed. The braſs-founders defend their furnaces, at leſs expence, with the refuſe ſand of the glaſs-grinders: they place a cylinder ſomewhat leſs than the hole, in the middle of it, and then ram this ſand in the ſpace left between the walls of the furnace and the ſides of the core: the ſand, in drying, ſoon ſhrinks from the cylinder, and ſuffers it to be drawn out, when the furnace is ready for uſe.

THERE are many other lutes; but theſe are ſufficient to carry on any chemical operation.

Of the degrees of FIRE.

THE ſeveral heats required in chemical operations, are as follow, *viz.*

Balneum mariæ is warm or hot water; *balneum vaporoſum* is the ſteam or vapour of water. The *heat of aſhes* is made in ſifted aſhes; and the *ſand-heat* in ſifted ſand [e]. There is alſo a *heat of filings of iron*, a *reverberating heat* or *naked fire*; and laſtly a *melting fire.* The water, aſhes, ſand, and filings of iron, are contained in proper veſſels made of copper or iron, and placed in furnaces, the reverberating, or open fire, is made in a furnace we call a reverberatory, or open furnace.

ALL theſe heats have their firſt, ſecond, third, and fourth degrees of fire.

THE firſt degree may be raiſed by a handful of ſmall-coal, or three or four charcoals, of the thickneſs of a man's finger, well kindled.

THE ſecond degree by ſix or ſeven ſuch charcoals kindled.

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[e] The ſand choſe for this purpoſe ſhould be a large coarſe grained ſand, ſeparated as well from the finer parts by waſhing, as from the coarſer by paſſing it through a ſieve. By the firſt, the heat is ſuffered to aſcend through it more eaſily; and by the laſt, the glaſſes, which are placed in it, are prevented from being broke by any little ſtones, which might otherwiſe be in it.

The third degree of heat is ſuch a one as will make the fire place of the furnace of a worm-red.

The fourth degree is ſuch as will cauſe the fire place of the furnace to be of a white heat, or the moſt extreme fire you can make.

Of dry heats, aſhes are weakeſt, ſand ſtronger than aſhes, and filings of iron ſtronger than ſand [f].

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[f] The degrees of heat which the chemiſts regulate their proceſſes by, are vague and uncertain; although it is almoſt ſelf-evident, that due regard hereto is of great conſequence, eſpecially in making the finer preparations. *Boerhaave* is the only one who has attempted to ſettle this matter upon rational principles; and he has excellently applied the mercurial thermometer of *Fahrenheit* to this purpoſe. The firſt degree of fire is that in which nature performs the office of vegetation in plants: This commences from the degree marked 1 on the thermometer, and ends at that marked 80. Within this degree of heat, the eſſences of vegetables are extracted in their appropriated menſtrua, in perfection; which a greater heat would ſtrangely alter. The ſecond degree may be limited between the 33d and 94th of the thermometer: within this compaſs, animals live and ſubſiſt; and this degree is uſed for making elixirs and ſome kinds of tinctures. The third degree of heat extends from the 94th to the 212th; at which laſt water uſually boils: within this degree, the more fluid parts of vegetables and animals are ſeparated, and the fluid parts of animals coagulate; conſequently all animals periſh therein. The fourth degree reaches to the 600th of the thermometer: this is very near the boiling point of mercury: within this latitude, oils, and the more ponderous acids, are diſtilled; lead and tin melt; the oils and ſalts of animals are changed, and ſublimed into volatile ſalts; alcaline ſalts are

Of ſuch terms as are uſed in Chemiſtry.

"ACIDS, are all thoſe things which taſte ſour, upon being reduced to a proper degree of ſtrength; as vinegar, juice of lemons, oil of vitriol, *&c.* and which effervefce with chalk, and the ſalts of vegetables prepared by incineration; and with ſuch like ſubſtances form a neutral ſalt. They are likewiſe diſtinguiſhed from alcalies, by turning ſyrup of violets red."

Alcohol, is an impalpable powder. Very high rectified ſpirit of wine is alſo called *alcohol.*

" *Alkali*, is any ſubſtance, which being mixed with an acid, an ebullition and effervefcence enſue thereon, and which afterwards forms a neutral ſalt. They are likewiſe diſtinguiſhed from acids by turning ſyrup of violets green."

Amalgama, is a mixture of mercury with gold, ſilver, lead or tin, which is to be done thus.

FIRST, melt the gold, ſilver or lead, *&c.* ſo that it may but juſt flow: then heat the mercury till it begins to fume; and by little and little pour the mercury to the melted metal, and ſtir them about with a warm iron rod, till they are incorporated.

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are parable. In the fifth degree, all the metals and the fixed ſalts melt; and moſt bodies vitrify or become volatile: this is the moſt extreme degree of heat in the chemical furnaces. The ſixth degree of fire is that collected in the focus of a large burning-glaſs; which ſcarce any ſubſtance is able to withſtand.

rated. If you would make the *amalgama* ſo hard as to beat into a powder, you muſt take three parts of the hard metal to one of mercury: if you would have it ſo ſoft as to ſpread, you muſt take two or three parts of mercury to one part of the hard metal [g].

"*Balneum mariæ*, (or rather *maris*) water-bath, is a veſſel of water ſet over the fire, in which another veſſel, containing the matter to be acted on, is placed."

"*Balneum arenæ*. In this, ſand is made uſe of inſtead of water [h]."

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[g] Any of the metals, except iron, may be amalgamated without heat, provided they are previouſly reduced either into thin leaves or ſubtile filings, *&c.* by grinding the powder or leaf with a ſuitable quantity of mercury.

[h] Baths of dry ſubſtances are far leſs convenient, in moſt caſes, than thoſe of liquid: for through the firſt the fire acts unequally, being hotter at the bottom than the top: hence various accidents ariſe, as empyreuma, boiling over of the matter, *&c.* hence alſo ariſes great diſſimilitude in the effects of the ſame proceſſes. The water-bath, therefore, where its heat is ſufficient, ſhould always be choſe: but as this goes but a little way, water being impatient of any great degree of heat, a bath compoſed of mercury will excellently ſupply its place, be far leſs troubleſome, and not ſo expenſive as at firſt it may be thought. If an iron pot be hung on its rim in another a very ſmall matter bigger (ſo that their ſides do not touch) and faſtened to it; a few pounds of quickſilver will fill up the ſpace between them to about three fourths of the height of the ſides, which will be ſufficient, and allow room enough for the expanſion of the mercury. For curious experiments, ſuch an apparatus is very convenient. The heat may be eaſily regulated, and equally applied; and as there is no need

" *Caput mortuum* is that part of the matter which remains after the proceſs is over, and is ſuppoſed to be uſeleſs or dead."

" *Cements* are certain matters which are placed between plates of metal in proper veſſels, to be afterwards expoſed to the fire, in order to purify, colour, or make ſome alteration in the metal. Thus, iron may be made into ſteel, by cementing it with charcoal-duſt: impure gold may be made finer by ſtratifying plates of it with a paſte called the royal cement:" this is compoſed of one part of ſal armoniac, two parts of common ſalt, and one part tobacco-pipe clay, or tobacco-pipes beaten to powder, moiſtened with a ſufficient quantity of urine.

Circulation is a motion given to liquors contained in a double veſſel, or circulating glaſs, by heat, cauſing them to aſcend and deſcend.

To *coagulate*, is by evaporating liquids, or mixing fluids of different qualities, to cauſe a more ſolid maſs.

To *cohobate*, is to return the liquor which has been diſtilled, upon the matter remaining in the veſſel

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need of any medium betwixt the retort, bolthead, or other inſtrument, and the inner pot, except a little fine ſand to reſt its bottom on; the matter may be viewed at any time of the proceſs: and in caſe the glaſs ſhould break, its contents will not be loſt, and in many caſes not injured. The glaſs likewiſe may be removed out of the action of the heat at any time, which is impracticable where ſand or iron filings are made uſe of, without endangering the breaking the veſſel.

veſſel after the diſtillation, " and to repeat this operation afreſh."

To *congeal*, is to let a metal, wax or fat, which is melted, fix or cool, when taken from the fire.

" *Crocus*, a name given to certain chemical powders, which in their colour ſomewhat reſemble ſaffron."

" *Cryſtallization* is the operation whereby ſalts, diſſolved in water, ſhoot into glebes of particular figures."

" To *melt per deliquium* is to diſſolve ſolid bodies, by expoſing them to the moiſture of the air; which ſome, as fixed alcaline ſalts, readily attract."

Detonation is a noiſe which is made when the ſulphureous parts of any mixture ruſh forth with impetuoſity It is alſo called *fulmination.*

To *digeſt*, is to put ſome matter into a menſtruum to infuſe in a gentle heat.

Diſtillation per aſcenſum is when the fire is to be made under that which is to be diſtilled.

Diſtillation per deſcenſum is when the matter which is to be diſtilled is placed under the fire, by which the ſpirits are precipitated and forced downwards.

Diſſolution is the reduction of any hard body into a liquor, by the help of a proper menſtruum.

To *edulcorate*, is to ſweeten or make inſipid any matter which is impregnated with ſalts, by waſhing it with pure water.

Efferveſcence is the ebullition of liquor, or of two liquors of a contrary nature put together, which cauſe ebullitions without ſeparating the parts.

" *Empyreuma* is the taſte or ſmell of any matter when burnt; or ſtrictly, the burning or ſcorching."

" *Feints* are a diſagreeable liquor which ariſes at the end of the diſtillation of inflammable ſpirits."

Fermentation is an ebullition raiſed by ſpirits which endeavour to ſeparate themſelves from the body, but meeting with earthy parts which oppoſe their paſſage, they ſwell and rarify the liquor, till they find their way out. In this ſeparation of parts, the ſpirits divide in ſuch a manner, as to make the matter of another nature than it was before[i].

" *Filtration* is the purification of a liquor by paſſing it through a ſort of paper, made for this purpoſe[k], ſupported by a funnel or a piece of canvas fixed in a frame. When the funnel is uſed, it is convenient to put ſome ſmall ſtraws or ſticks between the paper and its ſides, to prevent the weight of the liquor from preſſing the paper ſo cloſe to it, as not to allow room for the liquor to tranſude. In ſome caſes, the chemiſts employ a funnel made of wire for this purpoſe."

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[i] Fermentation is that inteſtine motion in bodies, by which a change in their compoſition enſues. There are ſeveral ſorts of fermentation. 1. Vinous fermentation is that motion in the parts of vegetable juices, *&c.* which produces an inflammable ſpirit. 2. Acetous fermentation is a higher degree of this motion, which combines the parts of vegetables, ſo as to appear upon diſtillation of an acid nature. 3. Putrefactive fermentation is ſtill a higher degree of motion either in vegetable or animal ſubſtances, which attenuates and combines their parts, ſo as, upon diſtillation with a ſoft fire, to produce a volatile alcaline ſalt.

[k] There are ſeveral ſorts of paper employed for this purpoſe. Some uſe coloured papers, which are in many caſes extremely improper, as they are apt to tinge the liquor which paſſes through them. The beſt filtering paper, is of a ſpongy and rare texture, which does not eaſily break when wetted; ſuch is the grey paper which covers the pill boxes, as they come from abroad.

Fumigation is the making one thing receive the fume of another.

Granulation is the reduction of a melted metal into grains, by pouring it through a birch-broom, or an iron-cullender, into cold water.

To *levigate* is to grind any matter into an impalpable powder upon a flat piece of marble.

" *Magiſtery* is a name given to certain white and light precipitates; and by it is uſually underſtood a very ſubtile ſeparation."

Menſtruum is any liquor capable of diſſolving metals, minerals, gums, or any other ſubſtance[1].

Mortification is the change of the outward form of a mixture, as mercury, *&c.* Spirits alſo, being mixed with other things which deprive them of their ſtrength, are ſaid to be mortified.

" *Neutral ſalts* are a ſort of intermediate ſalts between acid and alcali, and though compoſed of both, yet upon trial, exhibiting the marks of neither the one, nor the other."

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[1] It is called menſtruum from the time which the ſolution of a body was ſuppoſed to take, forty days, or a philoſophical month.

" *Oil.* The chemiſts apply this name to many liquors which have not the characteriſtic of oil, inflammability; ſuch as the oil of tartar per deliquium, which is only a fixed ſalt, diſſolved by the moiſture of the air into a liquid, reſembling oil in its conſiſtence only; and ſuch is the oil of antimony, which is nothing elſe but a mixture of the acid of ſea ſalt with the reguline parts of antimony. So likewiſe the vitriolic acid, when highly dephlegmated, is called, though with the utmoſt impropriety, oil."

Precipitation is ſaid to be performed, when any matter diſſolved falls to the bottom of the veſſel, when ſomething is put into the diſſolution which is more agreeable to the menſtruum[m].

To project is to put into a hot crucible, by little and little, any matter. ' The powder with which the alchemiſts are ſaid to tranſmute the coarſer metals into the finer, is called the powder of projection.'

Putrefaction is the corruption of any mixed body, whether by the air or other mixtures, and which always emits a ſmell different from the body before it was corrupted.

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[m] This definition is too limited: for when any body, ſuſpended in a fluid for ſome time, at length ſubſides by its own gravity, it is ſaid to precipitate. The chemiſts likewiſe apply this term to ſeveral ſubſtances, which from being volatile, are ſomewhat fixed either by fire or additions. Thus mercury, which digeſted for

“ *Quartation* is the ſeparation of gold from ſilver by aqua fortis. It is called quartation, becauſe if there is more than one fourth part of gold in the maſs, the menſtruum will not be able to act upon the ſilver.”

To rectify is to diſtil ſpirits a ſecond time, in order to ſeparate from them ſuch heterogeneous matters as have riſen with them in their firſt diſtillation.

“ *Regulus*, in the common acceptation of the word, is an impure metallic ſubſtance, which falls to the bottom of the crucible in the melting of ores, or imperfect metals. Thus when coarſe gold, melted with antimony, ſeparates from its allay, and ſinks to the bottom of the cone, it is called regulus, as being not yet perfectly purified; but when, by being fuſed with nitre, it ſubſides from the ſcoria quite fine, it is no longer called regulus, but pure or graduated gold.”

Reverberation is the return of the flame from the top of the furnace upon the matter to be reverberated.

“ *Revivification* is the reſtoration of a body to its firſt ſtate, after it has been altered by ſome operation. Thus cinnabar, and other preparations of mercury, are revivified into fluid mercury.”

Scoria is the droſſy ſubſtance which ſwims upon the ſurface of all metals, when expoſed to the immediate action of the fire, gold and ſilver, perhaps, ex-

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for ſome time, turns into a powder of ſo fixed a nature as to reſiſt a conſiderable degree of fire, is called mercurius præcipitatus per ſe.

excepted. The vitreous ſubſtance, which flows upon the ſurface of melted metals in running down their ores, is alſo called ſcoria or ſlag: ſo likewiſe is that compound matter which ariſes upon metallic ſubſtances in fuſion, when they have been mingled with ſaline or other fluxes. And ſometimes the ſcales which fly off in the forging of metals, are called *ſcoriæ*."

To ſtratify is to lay two different things, bed upon bed, or lay upon lay, one over another.

Sublimation is the elevation of any volatile matters into the upper part of ſuch veſſels as contain them, by heat of fire.

" *Sulphur*, in a chemical ſenſe, is the directly inflammable part of bodies; though the alchemiſts have their incombuſtible ſulphur; by which they ſeem to mean a certain conſtituent part of metals, to which their colour, ductility and fuſibility are owing."

The principles of minerals in the mines (not to ſay any thing of the univerſal firſt matter of things, not ſpecificate) are quickſilver and ſulphur; out of theſe two are all generated. All mercurial minerals, of which there are divers ſpecies, by the endeavours of nature, tend to the perfection of gold; but by different accidents are hindered, or at leaſt retarded, in their attaining to the intended perfection: for according to the purity, or impurity, of theſe two, are different metals produced.

CHAP. I.

Of GOLD.

GOLD, the pureſt of all metals, is by nature generated of a moſt pure fixed mercury, and a ſmall quantity of clean fixed ſulphur, of moſt pure redneſs, which tingeth the mercury. That it is moſtly mercurial, appears from its eaſy conjunction with, and reception of, pure mercury; that this mercury is fixed, is clear from all the operations upon it by fire: that the ſulphur of it is tinging, is manifeſt by this, that joined rightly with pure mercury, it transforms, or changes its colour into a moſt pure red[n].

It is a moſt noble ſubject for medicine, in the hands of an expert artiſt: witneſs Dr. *Anthony's aurum potabile.*

Puri-

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[n] Gold is the moſt heavy, ductile, fixed in the fire, and conſequently the moſt perfect of all other metals. Its weight is to that of water, as 19,640 to 1,000, and to that of tin, the lighteſt of all the metals, as 19,640 to 7,320. As ſoon as it grows white in the fire, it melts. It is diſſolvable by aqua regis alone, into a tranſparent fluid. It readily amalgamates with mercury, without heat. In the fire, it readily mingles with all the metals; but is eaſily ſeparable from them, without loſs. Melted with a mixture of fixed alcaline ſalt and ſulphur, it becomes ſoluble in water. When perfectly pure, it is extremely ſoft and flexible, and yields little or no ſound upon being ſtruck. It is neither hurt by lead, nor antimony: in this circumſtance it differs from ſilver and all the other metals; the firſt is preyed upon by antimony, and the others by lead.

Purification of Gold.

PUT one ounce of gold into a crucible; when it is red-hot, add to it of regulus of antimony three ounces; let them melt together in a ſtrong fire, till little ſparkles fly about in the crucible; then caſt out the golden regulus into a little cone, or let it ſtand in the crucible till it is cold; then beat off the ſcoria, and put the regulus into a crucible, and ſet it again in the furnace to melt. When it is in fuſion, caſt upon it two drams of ſalt-petre°, and a quarter of an hour after that, caſt two drams more of ſalt-petre, and ſo do the third time, ſtill keeping it melting, till you perceive it emits no fumes; then pour it into an ingot, and beat the ſcoria off from the gold. It is then perfectly fine, and fit for any operation.

There are other purifications of gold, *viz.* by the cupel, cementation, *&c.* but this is the beſt.

Amalgamation of Gold.

TAKE of fine gold half an ounce, beat it into thin plates, heat them red-hot in a crucible, put to them of clean mercury (firſt made hot in a crucible) two ounces, and ſtir them about together with

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° Whenever ſalts are to be projected on metals in fuſion, they ought to be carefully dried and made very hot, otherwiſe great danger will enſue; at leaſt ſome of the metal will be thrown over the ſides of the crucible.

with a hot iron-rod till they grow cool; then waſh the mixture in a ſtone-mortar, with clean ſalt and warm water, till the amalgama will emit no blackneſs; this done, it is pure: if it be too ſoft for your purpoſe, you may ſqueeze ſome mercury from it, through a diaper-cloth.

If you would reduce the gold into an impalpable powder, put the amalgama into an unglazed diſh or porringer, place it over a gentle fire, and the mercury will aſcend in a fume, and leave the gold in an impalpable powder[p].

Aurum Fulminans.

TAKE what quantity of gold you pleaſe, in thin plates, file-duſt, or ſmall granules, put it in a parting glaſs, or any other convenient one; pour upon it, by a little at a time, four times its quan-

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[p] The gilders uſually put about a dram of gold to ſomewhat more than an ounce of quickſilver: this mixture they ſpread all over the ſurface of the metal to be gilt, and then expoſe it to the fire, which evaporates the mercury, and leaves the gold in ſo fine a powder, as to adhere cloſely to the ſurface of the metal, into which it ſinks by a ſubſequent ignition; this the artiſts call water-gilding, from the fluidity which gold aſſumes with the mercury. This property of mercury to readily unite with gold and ſilver, refuſing, at the ſame time, to mix with ſand, dirt, *&c.* fits it for extracting theſe metals, when they have been naturally or accidentally mixed with ſuch ſubſtances. Thus gold and ſilver are obtained from the ſweepings of gold-ſmiths workſhops: and thus, in *Peru*, they ſeparate the ſilver from ſuch ſtony matters as it is uſually found with.

quantity of aqua regis, or ſpirit of nitre bezoardic: place the glaſs on warm ſand, and let it there continue till all the gold is diſſolved[q]; then put the diſſolution into five or ſix times its weight of clean water; mix them well by ſhaking; then drop to the ſolution, oil of tartar per deliquium, or ſpirit of ſal armoniac, made with ſalt of tartar, or pot-aſhes, till the ebullition is over; let it ſtand ten or twelve hours, for the gold to precipitate, and then pour off the water by gentle inclination: waſh the golden calx with ſeveral clean waters, till it is inſipid: dry in a gentle heat, between clean paper, and keep for uſe.

ITS operation is diaphoretic. Its doſe from five to twenty-five grains, given in peſtilential fevers, and ſmall-pox, with good ſucceſs; and it is often given to thoſe who have too much mercury in them.

BE careful in drying of it, leſt it explode[r].

Aurum

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[q] If the menſtruum ſhould entirely take up all the gold, a few grains more ſhould be added gradually, till ſome of them remain undiſſolved at the bottom of the veſſel.

[r] A blow, or violent trituration, will occaſion the ſame phænomenon; the utmoſt circumſpection is therefore neceſſary. If too much fixed alkaline ſalt be uſed in the precipitation of this calx, or if it be too much waſhed, its fulminating quality will be greatly impaired, if not deſtroyed. This may be remedied by digeſting it for ſome time in ſpirit of ſal armoniac prepared with a fixed alkaline ſalt. The calx may be reduced into gold again, by grinding

Aurum potabile, as I prepared it for the chief phyſician of a great prince, 1692.

I Diſſolved four ounces of gold (purified as before) in one pound of bezoartic ſpirit of nitre, and drew the ſpirit from the gold in a heat of ſand, returned the ſame ſpirit upon the gold, and diſtilled it off again. I made the ſecond cohobation with the ſame ſpirit, as alſo the third, fourth, and fifth cohobation, with one pound of new ſpirit of nitre bezoartic, and likewiſe the ſixth, ſeventh, and eighth cohobation, with one pound more of new bezoartic ſpirit of nitre.

Whilſt I was doing this, I made an oil of chalk thus: I took half a pound of clean chalk, ſcraped it, and dried it before the fire in an earthen-diſh; then put it into a cucurbit, and poured upon it, by little and little, one pound and a half of ſpirit of nitre, which diſſolved the greater part of the chalk. I filtred the diſſolution, put it into a retort, and diſtilled it in ſand; that which diſtilled from it, came off almoſt inſipid. I diſſolved that which remained in the retort, in part of the phlegm which I drew off from it; it left new feces: I filtered the diſſolution again, and exſiccated, as before. I put it a-

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grinding it carefully with double its weight of flower of brimſtone, then gently calcining it, and afterwards running it down in a crucible with borax. *Lemery* ſays, that one dram of gold will yield four ſcruples of this preparation.

gain in the phlegm which came off; it then totally diſſolved without any feces: I exſiccated it again, and mixed of it and the aforeſaid calx of gold, *ana*, and ground them extremely well together in a clean marble mortar, with a glaſs-peſtle.

I then divided the whole matter into equal parts, and with one part I ground double its weight of purified ſalt-petre, and with the other part treble its weight of ſal armoniac ſublimed twice, and its weight of ſtellate regulus martis, in ſubtile powder: each parcel being well mixed by a long trituration, I put this mixture in a retort, placed it in a ſand-furnace, made a gradual fire under it for eight hours, and kept it two hours longer in the moſt extreme degree of fire; the ſal armoniac roſe into the neck of the retort, ſo much impregnated with the ſulphur of gold, that it was as red as blood.

The other mixture of golden calx and nitre, I put into a red-hot crucible, by a quarter of a ſpoonful at a time, ceaſing one minute between each projection; when all was in, I gave it a ſtrong melting fire for three hours, and before it was cold, made it into powder, in a clean, warm iron-mortar, and put it preſently into a clean cucurbit, and put ſo much highly rectified tartarized ſpirit of wine upon it, as to appear four fingers above the mixture; then inverted another glaſs into the mouth of the cucurbit, to make a circulating veſſel, and let it ſtand in a ſimmering heat for twenty-four hours, in which time the ſpirit of wine was well tinged: I decanted it, and put on more ſpirit of wine, and let it ſtand twenty-four hours in the ſame manner as before, and did ſo the third time, but then it took but little tincture.

I ordered the ſublimed and impregnated ſal armoniac, with the ſpirit of wine, as I did the other; I put the tinctures of each parcel apart into cucurbits, adapted heads and receivers to them, and in a gentle heat drew off the ſpirit of wine, not leaving above eight ounces in each glaſs: both the tinctures were deeply tinged; of which I gave a part to the gentleman that employed me, who ſeemed to receive them with great ſatisfaction, and gratified me generouſly.

THE operation of both the tinctures is diaphoretic, and they are eſteemed great cordials. Their doſe is from five to twenty-five or thirty drops, in a glaſs of *Spaniſh* or *French* wine, or any other vehicle, even to water. They are good in cachexies, conſumptions, all ſorts of fevers, and to ſuch whoſe bodies have been over-charged with mercurials.

THE ſeveral cohobations are to ſubtilize the gold; the calcined and purified chalk is ſubtilized ſufficiently to mix with the minute particles of gold, the better to make it give forth its ſulphur to the menſtruum. In its fuſion with the ſalt-petre, it emits its ſulphur into the nitre, the moſt groſs part falling to the bottom in a regulus. Its being projected into the crucible in ſo little a quantity at a time, and ſo leiſurely, is to prevent its boiling over; which it would do by too haſty projections. Its being mixed with clean ſal armoniac, is to cauſe its pure ſulphur to ſublime; it being the nature of ſal armoniac, to carry up metallic ſulphurs. The tinctures are taken each by themſelves, that the phyſician may uſe them alone, or mixed, as he pleaſes. When we reduced the gold, we had three ounces, three drams, two ſcruples, and five grains, of a little paler colour than it was at our firſt diſſolution of it[s].

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[s] Theſe tinctures are real ſolutions of gold in aqua regia, diluted with ſpirit of wine: for it by no means appears probable, that the gold was divided into its conſtituent parts, or that its ſulphur (as here ſuppoſed) was extracted by the menſtruum. For, although it ſhould be admitted, that the gold which was not taken up in the tinctures, appeared, upon being reduced, really of a little paler colour than it was before its diſſolution; yet it cannot be fairly inferred, that any of its colour was extracted; ſince the gold, before the diſſolution, might only ſuperficially be of a higher colour, occaſioned by its tarniſhing, or by its being heightened artificially, as the uſual practice is: and, on the other hand, it is not improbable, that this paleneſs or whiteneſs might be owing to the menſtruum, which being drawn from a preparation of antimony, might have carried over with it ſome of its reguline parts, and depoſited them in the gold. As to the medicinal virtue of aurum potabile, it is greatly to be doubted whether, as commonly prepared, it is not really injurious to the body rather than beneficial; ſince moſt of theſe preparations abound with acrimonious ſalts, and ſince it is not probable that the gold paſſes any farther than the primæ viæ. But, indeed, the notion upon which the virtue of gold, as a medicine is founded,

CHAP. II.

Of SILVER.

SILVER, or luna, is generated or produced by nature of pure mercury, and a pure, clean, and fixed white ſulphur; but comes not yet up to the purity and fixation of gold, as is evident by its diminution in the fire, as alſo of its ſulphur, which is neither fully fixed, nor incombuſtible: but though its ſulphur, compared with that of gold, cannot properly be ſaid to be fixed; yet with reſpect to other metals, it may be called fixed and incombuſtible[t].

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is erroneous, and built upon wrong principles. If it was poſſible to give gold the fluidity and ſubtility which are found in mercury, without heat or addition, it might acquire ſome medicinal virtues; though, even then, it would be difficult a priori to determine of what kind; for mercury ſeems to act by another quality than its mere weight or ſubtility.

[t] Silver is the moſt ductile, malleable and fixed in the fire, of all bodies after gold. It melts in about the ſame degree of heat. It is ſoluble in aqua fortis; but not in aqua regia. It is difficulty ſoluble in either the pure vitriolic or marine acid, but may be artfully combined with each: the latter deſtroys its fixity in the fire. Its ſpecific gravity is leſs than that of lead, and is to gold as 11,091 to 19,640, and to water as 11,091 to 1,000. It readily amalgamates with quickſilver; and in the fire mingles with all the metals: arſenic and antimony volatilize it; from the reſt it is eaſily ſeparable. Heated red-hot, it immediately, if ſulphur be thrown upon it, melts; and when cold, looks more like lead than ſilver. It may be reſtored to its priſtine form by the addition of iron.

Preparations of SILVER.

Purification by the cupel.

SET a cupel, made of bone-aſhes, "upon a brick or tile", in a melting furnace; make a gradual fire to it, till the cupel is red-hot; and to every ounce of ſilver you deſign to purify, put four ounces of lead[u]. When it is melted, (or you may put them in together) put in your ſilver to the middle of the teſt, keeping ſtill a good fire about it (under a muffle) till you ſee the ſilver lie like a poliſhed lump in the middle of the teſt; then let it cool, and beat it from the teſt, and it is perfect, fine, and fit for any phyſical preparation.

LEAD is made uſe of to ſeparate ſuch baſe metals as ſuperficially adhere to the ſilver; for being full of ſulphureous parts, it readily abſorbs and ſucks up the baſe metals, which alſo abound with foul ſulphurs, and will not permit them to enter the cloſe pores of the ſilver[w].

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[u] *Boerhaave* directs the ſilver to be cupelled with ten times its weight of lead. This quantity, if the ſilver is coarſe, will more effectually purify it than a leſſer, though ſo much is not always neceſſary, for the quantity of the lead muſt be proportioned to the impurities of the ſilver. This proportion therefore of lead, if the ſilver is pretty fine, occaſions an unneceſſary expence and trouble.

[w] Lead is called balneum ſolis & lunæ, the bath in which gold and ſilver are waſhed from their accidental impurities. This metal readily unites itſelf to all the reſt, and vitrifying with each of them except gold and ſilver, reduces their parts to ſuch a degree of tenuity, as readily to ſink into the pores of the containing veſſel, leaving the two purer metals, as it were, untouched.

The teſt is made of bone-aſhes, becauſe theſe aſhes contain no fixed ſalt, and therefore are porous enough to ſuck in the lead, with the baſer metals, which adhered to the ſuperficies of the ſilver [x].

The diſſolution, and cryſtals of ſilver.

TAKE of cupell'd ſilver what quantity you pleaſe, put it into a parting glaſs, or cucurbit; and pour to it four times its weight of good aqua fortis [y]: ſet them in ſand over a gentle fire, till the ſilver is diſſolved; then evaporate two thirds of the liquor, and ſet it in a cold place to ſhoot into cryſtals.

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[x] The teſt is ſometimes made of the aſhes of vegetables, freed from their fixed ſalt by repeated affuſions of water, to prevent the teſt's readily vitrifying, which the ſalts diſpoſe it to, and which would greatly impede the operation. Calcined bones are generally held to be the moſt proper ſubſtance for this purpoſe, and cupels or coppels, which are a leſſer kind of teſts, are uſually made of theſe. See the figure in plate I.

[y] If the aqua fortis is ſtrong, it will diſſolve more ſilver than is here directed: it is convenient therefore, in order to ſave time and expences, to add gradually as much ſilver to the menſtruum as it will take up.

If in the beginning of the diſſolution, the aqua fortis looks milky, it is a ſign that there is either ſome of the vitriolic acid in it, or ſome common ſalt, from which it ſhould be ſeparated, to fit it for diſſolving ſilver; this may be effected by the following method.——Diſſolve ſome ſilver in a little aqua fortis; paſs the mixture through a double filtring paper placed in a funnel, by a little at a time, to prevent breaking it; the menſtruum will come through clear. Pour a little of this ſolution into the aqua fortis which is to be purified; it will grow milky, and by ſtanding depoſite a white ſediment, from which it is to be carefully decanted: add to this a drop of the ſolution as before; if the aqua fortis grows turbid again, more of the ſolution is to be added, till ſuch time as the menſtruum remains perfectly clear upon letting fall into it a drop of the ſolution; it is then fit for uſe.

Make all the diſſolutions of ſilver, or any other metal, or mineral, with aqua fortis, in a chimney, to avoid the nitrous fumes, which are hurtful to the head [z].

The infernal Stone, or ſilver Cauſtick.

TAKE of the cryſtals of ſilver one ounce, put them into a crucible which is capable of containing five or ſix times their quantity, by reaſon they are apt to boil and ſwell: you muſt give a very gentle heat till the ebullition is over; then increaſe the fire a little, till the ſilver ſinks, and flows like oil, and caſt it into a warm greaſed ingot-mould [a]: keep it in a box, with ſome cotton, in a dry place.

The

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[z] The vapours which exhale during the diſſolution of metals in the various kinds of aquæ fortes, are not only extremely offenſive, but very prejudicial, which hinders any obſervation of the action of the menſtrua being made, and likewiſe renders this proceſs very incommodious to ſuch as have not the conveniencies of chimnies, *&c.* Theſe may be prevented by pouring upon the ſurface of the liquor a little quantity of common oil, which hinders the diſſipation of the menſtruum, and increaſes its diſſolving power. The curious are obliged to Mr. *Geoffroy* for this diſcovery. Mem. de l'acad. des ſciences pour l'ann. 1719.

[a] In caſe of want of a proper mould, one may be eaſily formed of tempered tobacco-pipe clay, not too moiſt, by making in a lump of it as many holes as you have occaſion for, with a ſmooth

The ſilver Pill.

DIſſolve one ounce of refined ſilver in three ounces of ſpirit of nitre, in a matraſs; diſtil off all the ſpirit of nitre to dryneſs; then diſſolve the matter remaining, in as much roſe-water as it requires; filter and evaporate again to dryneſs: then take two ounces of refined ſal prunellæ, and grind it well with the lunar calx, in a marble mortar, with a glaſs peſtle, and put to it again as much roſe-water as is fit to diſſolve it; filter and evaporate again to dryneſs. When it is cold, put it again into a marble mortar, and add two ounces of the fineſt wheat-flower; grind them well together, with a ſufficient quantity of roſe-water, to make them into pills of the bigneſs of a ſmall pea: when the pills are formed, dry them between two papers, and keep them in a wooden box for uſe.

THEIR operation is cathartic and diuretic. They are given in all diſtempers of the head, and very ſucceſsfully in dropſies. Their doſe is from half a pill, to one pill and an half, or two pills [b].

ſmooth conical ſtick firſt greaſed. Into theſe cavities the preparation may be ſafely poured, and, when it is congealed, eaſily taken out by breaking the mould.

An ounce of cupelled ſilver will yield an ounce and five drams of the infernal ſtone.

[b] This pill, which is taken from Mr. *Boyle*, is a very uncertain medicine, and requires the utmoſt care in its preparation, to prevent

The cryſtals, or vitriol of ſilver, receive their cathartic quality from the purified ſal prunellæ, with which they are mixed; for the ſharp points of the ſpirit of nitre which adheres to the lunar cryſtals, are blunted by the ſal prunell, which makes them ſlide through the bowels, which otherwiſe would corrode them, and be as fiery a cauſtic as the infernal ſtone.

The precipitation and tincture of Silver.

Diſſolve one ounce of fine ſilver, in three ounces of ſpirit of nitre, in a glaſs veſſel placed upon warm ſand: when it is diſſolved, put it into ſixteen ounces of filtered brine. The ſilver will precipitate in a white powder; let it ſtand two hours to ſettle, then pour off the water by inclination: waſh the lunar calx with warm fountain-water, till it is inſipid; then dry it upon clean paper [c]: when it is dry, put it into a matraſs, and pour

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prevent its too great corroſiveneſs. *Boyle* directs the ſolution of ſilver to be cryſtallized, and "warily and ſlowly dried, without melting," in order to evaporate as much of the acid as poſſible. *Boerhaave* ſays, that thus managed, theſe pills purge gently, without griping, and bring off a conſiderable quantity of water, almoſt without the patients perceiving it. Uſed too freely, they are injurious to the ſtomach; which inconvenience may be remedied by the rob or extract of juniper-berries.

[c] An ounce of ſilver diſſolved in ſpirit of nitre, and precipitated with common ſalt, will yield one ounce and three drams of precipitate. If this precipitate be expoſed to a moderate heat, it readily melts; and when poured out into a thin plate, appears tranſparent and flexible like horn, whence it has its name

pour upon it twelve ounces of ſpirit of wine, to which put half an ounce of volatile ſalt of urine; ſtop the matraſs with another glaſs, fitting its mouth; lute the joint with bladder dipt in the white of an egg, beaten well with a little water; then ſet it in a gentle heat twelve or fifteen days, ſhaking it about once in twenty-four hours; in which time it will have acquired a ſky-coloured tincture[d]: when cold, unlute the glaſs, filter the tincture, and keep for uſe.

Its operation is diaphoretic and diuretic. It is given in apoplexies, epilepſies, palſies, and all diſtempers of the head. Its doſe is from five to twenty-five or thirty drops, in any proper vehicle. The calx remaining in the cucurbit, may be reduced into ſilver again, by mixing it with equal its weight of charcoal-duſt, and a fourth of its weight of borax, giving them a good fluxing fire in a crucible.

The

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name Luna cornua. In no very great degree of fire, it becomes totally volatile. This maſs appears, upon examination, to be compoſed of ſilver, and the acid of ſea ſalt: their ſeparation therefore is eaſily pointed out; to wit, by an alkaline ſalt, which eaſily imbibes the acid, letting the ſilver aſſume its original form when expoſed to the fire.

[d] This colour is owing to ſome ſmall particles of copper remaining in the ſilver, from which it is difficultly freed; for the ſolution of pure ſilver is quite colourleſs. This preparation ſeems fitter for ſome external purpoſes, as dying the hair black, which it will excellently do without injuring it ſo much as the famed hair water, than for internal uſe.

THE precipitated ſilver cannot be totally ſeparated from the nitrous ſpirits by waſhing, therefore the tincture is not (as ſome fancy) the pure ſulphur of ſilver ſeparated from its terreſtrious and ſaline parts, by the ſpirit of wine and ſalt of urine; but it is part of the lunar calx, diſſolved by the ſpirit of nitre, which ſticks to the particles of the calx, and ſo communicates that ſky-colour to the menſtruum: for I have more than once obtained from this tincture malleable ſilver.

THE diſſolution of ſilver is ſeveral ways precipitated, *viz.* by a lixivious, urinous, or common ſalt, and by plates of copper. And again, copper will be precipitated by iron; and that again by lapis calaminaris; and the lapis calaminaris will be precipitated by a lixivium of fixed nitre, or ſalt of tartar; and that lixivium by evaporation will yield common ſaltpetre again.

Diana's, *or the philoſophical Silver-tree.*

DIſſolve one ounce of fine ſilver, in three ounces of rectified ſpirit of nitre; pour the diſſolution into a matraſs, in which there is a pint of clean fountain-water [e], and two ounces of clean crude

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[e] To make this experiment ſucceed the better, the water ſhould be diſtilled; for there is hardly any ſo pure as not to grow turbid upon pouring in the ſolution of ſilver.

In the memoirs of the royal academy of ſciences at *Paris*, for the years 1704, 1707, 1710, and 1731, is contained a great crude mercury; let the matraſs be no bigger than to contain this quantity; cover it looſely, to keep out the duſt, and ſet it by in ſome place where it may not be moved for five or ſix weeks; in which time you will ſee a repreſentation of a tree ſpreading forth its branches, with little knobs at their ends reſembling fruit.

ANOTHER curioſity of this nature may be performed, with a diſſolution of ſilver in ſpirit of nitre, and diſtilled vinegar; but neither of them being of any other uſe than mere amuſements, this will be ſufficient at this time.

THE philoſophical tree, is a cryſtallization of the diſſolved metals, which in five or ſix weeks time will appear of different forms, according to the quantity of water, and capaciouſneſs of the veſſel which contains it; if there be too little water, it will be a confuſed lump of cryſtals; if too much, it will fall into a precipitate.

C H A P. III.

Of TIN.

TIN is a ſoft metal, of a ſhining blue colour, containing a mercury ſomething purer than the other ignoble metals: it is more ſoft and volatile than

great variety of theſe experiments; and many ſuch phænomena may be eaſily made to appear, by expoſing ſolutions of various ſalts, or of metals in their appropriated menſtrua, contained in wide-mouthed glaſſes, to the action of the free air; for the fluid gradually exhaling in length of time, many pictureſque cryſtallizations will ariſe round the ſides of the veſſel, above the ſurface of the liquor.

than copper or ſteel, more fixed than lead, and more crude than ſilver. All its preparations are accounted ſpecific for diſeaſes of the liver and matrix[f].

Purgation of Tin.

PUT what quantity of tin you pleaſe into a little pan of iron; ſet it over the fire, and when it begins to melt, put to it ſome hog's-lard, wax, or honey; ſtir them about with a wooden or iron ſpatula, and then caſt them into hot water: repeat this two or three times, by which the tin will be cleanſed from ſome of its foul ſulphur, and made more bright and hard than it was before. It is poured into hot water, the better to ſeparate the fat from it, which you mix with it in its purification.

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[f] Tin is the lighteſt of all the metals (its ſpecific gravity being to that of gold, as 7,320 to 19,640, and to water, as 7,320 to 1,000) but the heavieſt of all other known ſubſtances. It melts in the fire long before ignition; and is ſoon converted into ſcoriæ, which appear upon the ſurface of the melted metal, like wood-aſhes: part of it evaporates into ſmoke. It eaſily amalgamates with mercury; is corroded by the vitriolic acid, imperfectly diſſolved by the nitrous, but readily by the marine acid. It deflagrates with ſulphur, and then remains unmelted in a ſtrong fire. It mingles with gold, ſilver and mercury, but renders them brittle; which even the ſmalleſt quantity, or the very fume of it, does in a very ſurprizing manner. It forms with iron a brittle regulus readily obeying the magnet. It may be diſtinguiſhed by the ear from all the other metals, making a crackling noiſe in bending.

To reduce Tin into a Powder.

MELT half a pound in a crucible[g], and pour it into a round wooden box[h], cover it cloſe, and ſhake it about till it is cold; ſome part of it will be in a grey powder: that part which remains in ſolid metal, melt again, and put it in the box, ſhaking it as before. Repeat the ſame operation, till you have as much of the tin pulverized as you deſire.

" *Solution of Tin.*

TAKE ſixteen ounces of proof aqua fortis, (ſee aqua fortis); diſſolve in it half an ounce of purified ſal armoniac: let fall into this menſtruum, of pure granulated tin, grain by grain, waiting till one is diſſolved before another is pu in, as much as it will take up. The liquor will then appear of a bright yellow colour, without any

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[g] An iron-ladle is more convenient, and the metal ſhould be ſcummed clean before it is poured into the box.

[h] It is convenient to rub the inſide of the box with chalk, which prevents the metal from adhering to the wood, and burning it. The chalk may be ſeparated from the tin by waſhing it with water.

Tin may be broken to pieces by heating it till it is ready to melt, and then ſtriking it a blow with a hammer. By this method large blocks of pure tin are eaſily broke into pieces, and thus fitted for particular purpoſes. The purer ſort of tin is called grain tin, from the facility with which it breaks into long ſhining pieces when treated after this manner.

ſediment. If the proceſs is hurried on, red vapours will ariſe in conſiderable quantity, and the tin be precipitated from the menſtruum.

This preparation dropt into a ſolution of gold diluted with a large quantity of pure water, throws down a precipitate of a purple colour, a little of which being melted with a conſiderable quantity of white glaſs, turns it of a tranſparent and beautiful red, reſembling that of rubies.

This is the beſt method of diſſolving tin for the uſe of the ſcarlet-dyers; and to the neglect of duly attending to the circumſtances here mentioned, are owing the frequent miſcarriages complained of in this branch of the dying buſineſs."

Amalgamation of Tin.

Melt what quantity of tin you pleaſe in a crucible; put the ſame quantity of mercury into another crucible[1]; let the mercury ſtand in the fire till it begins to crackle and fume; then pour it out to the melted tin, and ſtir them about with a ſmall iron-rod till they are cold. If you would have the amalgama ſo hard as to beat into powder, one part of mercury will be enough for two parts of tin; but if you would have it ſoft, you may put two parts of mercury to one part of tin.

The amalgama of tin and mercury ought to be waſhed in ſeveral waters warmed, to take away its blackneſs.

Cal-

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[1] Two iron-ladles are more convenient than crucibles.

Calcination of Tin.

PUT what quantity you pleaſe of tin into an iron dripping-pan, place it in a reverberating oven, and make ſuch a fire, as to keep it melting red-hot, every now and then ſtirring of it with an iron ſpatula, full of holes, the better to break the tin, and forward its calcination: this you may continue till you have a ſufficient quantity for your uſe[k].

Salt of Tin.

TAKE what quantity you pleaſe of the aforeſaid calcined tin, and reverberate it yet two or three hours longer, ſtirring it all the time, till it becomes more white than it was in the firſt calcination: then put it into a pewter or glaſs veſſel, and to each pound of the calx of tin, put ten pound of diſtilled vinegar; let them ſtand (now and then ſtirring them about) in a ſmall heat of ſand, till the vinegar has acquired a ſweet taſte; then decant and filter the liquor, and ſet it to evaporate in a pewter-baſon, and when you ſee a film appear upon the ſurface of the liquor, pour it into a glaſs funnel (the hole of it being ſtopped with a cork) and ſet it in a cool place to ſhoot into ſalt: you may evaporate

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[k] Tin, during its calcination, emits a conſiderable quantity of fumes, yet upon weighing the calx, it is found to have gained about a ſixteenth part in weight, more or leſs as it is differently calcined.

porate and cryſtallize the remaining liquor after the ſame manner.

IF you deſign to make ſalt of the calcined tin, you muſt put it into an iron flat pan, and reverberate it two or three hours longer, till it inclines to a whitiſh grey colour[1].

Sublimation of Tin.

MIX one part of tin with two parts of clean ſal armoniac; both being made into fine powder, and well mixed, put them into an earthen-cucurbit, which will endure the fire; but above two thirds muſt remain empty: place it upon an iron bar, in an open furnace, which muſt be ſet nine or ten inches above the grate; and a third part of the cucurbit remain above the top of the furnace. Incloſe the lower part of the cucurbit with tiles and lute; leaving three or four regiſters at an equal diſtance one from another, to give air to the fire; then fit to the mouth of the cucurbit, two or three aludels, and a blind head; lute them, and kindle the fire, and encreaſe it gradually, till the lower part of the pot is red-hot; in which ſtate keep it, till you perceive the aludels and head cool; then unlute the aludels carefully, without ſhaking, and wipe off the ſublimate which adheres to them, and alſo that which ſticks to the upper part of the cucurbit.

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[1] Several of the chemiſts have been of opinion, that the making a ſalt of tin, with diſtilled vinegar, is impracticable. But, if the tin be ſpread thinly over the bottom of the veſſel, the calcination performed in a very gentle heat, and continued for three or four days, ſtirring it frequently, and the air paſs freely over its ſurface; great part of the calx will readily diſſolve by digeſtion in ſtrong diſtilled vinegar; ſo as, upon evaporation to the conſiſtence of a ſyrup, to afford elegant cryſtals; eſpecially if about one twentieth part of ſpirit of wine be added to the inſpiſſated ſolution, before it is ſet to cryſtallize.

You ought to take care that the ſal armoniac be clean, otherwiſe ſome particles of dirt which have accidentally adhered to the ſal armoniac may diſcolour the flowers.

The Magiſtery of Tin.

Diſſolve the aforeſaid ſublimate in clean warm water; filter the diſſolution, and precipitate it with ſpirit of ſal armoniac, or oil of tartar per deliquium. The precipitate will be very white; which muſt be waſhed with ſeveral waters, till the calx is inſipid; then dry it gently between papers, and put it up for uſe.

It is a good fucus, and uſed in pomatums, or waſhes.

In the precipitation of this magiſtery, you may uſe ſpirit of ſal armoniac, or oil of tartar per deliquium, indifferently; for they both being alkalies, weaken the acid ſpirit in the ſublimate, ſo that it lets fall the tin which was diſſolved by it.

There is alſo a magiſtery of tin, made by diſſolving it in aqua regis; pour four ounces of the diſſolution into half a pound of clean water, it will immediately turn white: let it be in a veſſel which will contain three or four pints; then put to it gradually ſo much ſpirit of ſal armoniac, till the ebullition ceaſes; a white curdy matter will precipitate; waſh that precipitate with clean water till all its acrimony is quite gone, and dry it gently. This magiſtery will more readily diſſolve in diſtilled vinegar, and make a better ſalt of tin than that calx made by calcination.

THE aqua regis is made of three parts of ſpirit of nitre, and one part of ſublimed ſal armoniac.

Flowers of Tin.

TAKE one part of the powder of tin, and two parts of ſalt-petre; mix them very well; then have ready an unglazed cucurbit, with a hole in its middle, by which the mixture muſt be projected: let the furnace be of a fit proportion, ſo that there may be two inches clear between the pot and ſides of the furnace: place it upon an iron bar, ſix or ſeven inches diſtant from the grate; fit it in with tiles and lute, as you did in the ſublimation; have alſo a ſtopple fitted to the hole in the middle of the pot. When the pot is fitted into the furnace, fit to it (and lute the joints well) three or four aludels, and to the uppermoſt, a head with a beak, to which a receiver muſt be fitted: kindle the fire, and when the bottom of the pot is red-hot, caſt about half an ounce of the mixture into the hole, which preſently muſt be ſtopped; a detonation will

follow:

ſollow: when it is over, project another half ounce, and ſo continue (ſtill keeping up the fire till all the mixture is in; then let all cool, and unlute the veſſels carefully, and wipe off the flowers upon clean paper; put them in a clean veſſel, and waſh them with fountain-water till they are taſteleſs; dry them gently between paper: when dry, put them up in a vial for uſe. They are very white, and ſerve for the ſame uſe with the former.

IN the receiver you will find a nitrous ſpirit, and in the bottom of the pot you will have a hard lump, which is the groſſer part of the tin, and fixed nitre. By boiling or ſteeping of it in warm water, you will have the water impregnated with the ſalt-petre[m]; which you may evaporate to dryneſs, or cauſe it to diſſolve per deliquium.

THE jovial calx being waſhed ſweet and dried, ſerves to be uſed in deſiccative ungents.

SOME there are who pretend to order the flowers, and fixed powder of tin, ſo as to whiten copper.

IN the ſublimation of theſe flowers, I have ſometimes uſed one part and a half of ſalt-petre to one part of tin, and ſometimes three parts of nitre to one part of tin; but I find by experience two parts of nitre, to one part of tin tobe the beſt proportion; for

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[m] Part of the ſalt-petre is changed into a fixed alkaline ſalt in this operation.

for if there be too much nitre, there wants ſulphur to give flagration to raiſe the flowers; and if there be too little nitre, there will not be of the nitrous ſpirit ſufficient to raiſe them. Alſo note, that where this powder of tin is to be uſed, it is indifferent whether it be that made by ſhaking in a box, or a hard amalgamation beaten to powder, or fine filings of tin.

The Gummy Smoaking Oil of tin.

TAKE one part of powder of tin, and three parts of mercury ſublimate; mix them quickly and put them in a retort; place it in ſand, and lute a large receiver to it; give it a gentle fire, which will bring over a ſmoaking ſpirit[n]: when thoſe fumes decreaſe, augment the fire a little, and a butter or gum will aſcend into the neck of the retort;

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[n] The liquor which ariſes firſt in this proceſs is the acid of ſea-ſalt diſlodged from the ſublimate by the tin, and elevated along with ſome portion of the metal. The air acts ſo powerfully on this, that immediately upon unluting the diſtilling veſſels, great part is diſſipated in white ſuffocating fumes, which are ſcarce to be avoided. The beſt method of managing this dangerous operation is to make choice of a wide necked retort, to prevent the gummy matter from blocking up the paſſage, and ſo burſting the veſſels. The receiver ſhould have a ſmall pipe fixed to its lowermoſt part, ſo that the liquor which is condenſed in its belly may run into a bottle adapted to the end of the pipe. When the ſmoaking ſpirit is all come over, the bottle may be removed and ſtopped cloſe, and another put in its room.

at laſt, let the fire be increaſed two or three hours, to the fourth degree, and crude mercury will aſcend with a good part of the tin, in grey flowers ; ſeparate the mercury, and put all the reſt of that which is ſublimed, in a tin pan, to diſſolve in the air, into an oil, per deliquium.

In your mixture of tin and mercury ſublimate, for the ſmoaking ſpirit, you muſt immediately put them into a retort, otherwiſe they will attract air, and grow clammy, and be troubleſome to put in.

Aurum Moſaicum.

TAKE of mercury, tin, ſal armoniac, and flowers of ſulphur, ana four ounces ; let them all be made clean, and grind them in a marble mortar, till they are perfectly mixed ; then put them into a bolt-head, ſet it in a ſand-furnace, give it gradual fire, to the third degree, in which keep it two hours ; then increaſe the fire to the fourth degree, and keep it ſo for one hour longer : when all is cold, break the glaſs, you will find a dirty ſublimate ; which put away, and the aurum moſaicum will remain in the bottom of the matraſs°.

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° This golden-coloured ſubſtance ſparkles and appears extremely beautiful, and is more made uſe of as a pigment, by the painters, than as a medicine. The proportion of tin in this compoſition may be conſiderably encreaſed with advantage ; and if the tin be calcined with a ſomewhat larger proportion of ſulphur, and then ground with the ſal armoniac, the mercury may be entirely omitted, as being of no other uſe in the compoſition, than to render the tin miſcible with the other ingredients.

You muſt amalgamate the tin and mercury, to grind with the ſulphur and ſal armoniac.

ITS operation is diaphoretic, and is adminiſtred againſt hypochondriac diſtempers, fits of the mother, and the venereal pox. Its doſe from ten grains to one ſcruple. Its ſtench is very offenſive, but not pernicious: to avoid the offence, ſet it to work in a chimney. The degrees of fire is the greateſt ſecret in the making this medicine, which obſerve thus: keep it in the firſt degree one hour, in the ſecond degree two hours, in the third degree two hours, and in the fourth degree one hour.

CHAP. IV.

Of LEAD, *or* SATURN.

LEAD, or *Saturn*, is a foul metallic body, and imperfect, compoſed of a quickſilver, impure, not fixed, and feculent; ſomewhat white outwardly, but inwardly red, and of a ſulphur in part combuſtible; it wants purity, fixation, colour, and ignition, yielding to an expert phyſician excellent medicines[p].

Puri-

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[p] Lead is the heavieſt of all the metals, except gold: its ſpecific gravity, compared to that of gold, is as 11,325, to 19,640. It melts in the fire long before red-hot; and is ſoon converted partly into ſmoke, and partly into ſcoriæ, which are found to increaſe in weight, according as they are more or leſs calcined. It eaſily amalgamates with mercury. It is corroded by the vitriolic acid, and diſſolved by the nitrous acid, with which

Purification of Lead.

IT is purified by melting with honey, wax, or fat, and pouring them into hot water, in the ſame manner as you do tin.

THE pouring it into hot water, is to ſeparate the fat from it.

Calcination of Lead.

IT is calcined in an iron pan, being kept red-hot, and ſtirring with an iron ſpatula, after the ſame manner as you did tin, till it comes to an aſh-coloured calx. This aſhy calx being put to reverberate three or four hours longer, becomes red, and is called red lead, or minium. The white-lead, or ceruſe, is made of plates of lead, by the ſteam of vinegar, after this manner: they put into a glazed earthen pot, plates of lead, ſo that they may lie hollow, either by hanging them upon a wire, or otherways, and ſetting them in a bed of horſe-dung, (with a ſufficient quantity of vinegar in the pot) for three weeks or a month's time: when

which cryſtallized, it detonates in a red-hot ladle: the marine acid does not totally diſſolve it: the vegetable acids readily act upon it, eſpecially when calcined. Lead deflagrates with ſulphur, and turns into a ſparkling maſs hardly fluxible. It readily mingles with all the metals, except iron; and in a violent fire deſtroys all the metals, except gold and ſilver: it eaſily vitrifies, and then acts upon iron. Glaſs of lead in fuſion diſſolves any ſtones and earths whatſoever, and therefore ſoon runs through the veſſel in which it is expoſed to the fire.

when they are taken out, beat off what is calcined, and put the reſt into the pots again with new vinegar, and order them as before, till all is brought into ceruſe. Lead is alſo calcined by ſpirit of nitre, aqua fortis, aqua regis, ſpirit of ſalt, or any other corroſive.

LITHARGE is made by the refiners, when they refine great quantities of ſilver; that which is of a pale colour, they call Litharge of ſilver, and that of yellow or red, Litharge of gold. And theſe have their colour, according to the degrees of fire they have paſſed [q].

BURNT lead, or plumbum uſtum, is made by mixing two parts lead, and one part ſulphur (the lead in filings, and ſulphur in powder) put into a pot, and ſet in a fire to burn, as long as any combuſtible ſulphur is left.

LEAD gains weight by calcination [r], becauſe a greater quantity of igneous particles inſinuate themſelves into it, than the ſulphureous ones the fire drives out: for in calcination, the acid of the fire joins itſelf to the alkali of the lead, and having driven away its combuſtible ſulphur, makes a new and incombuſtible body.

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[q] Lead is converted into litharge by expoſing it to the immediate action of the fire. This is obtained in great quantity from the works wherein ſilver is ſeparated from lead; which is preferable to that obtained from the refiners, as having leſs of any other metal in it.

[r] Twenty pound of lead gains five pound by a long and vehement calcination; the calx being reduced into lead again, is found one pound leſs than the original weight of the metal.

WHITE lead alſo gains in its weight by the acid particles of vinegar; and burnt lead by thoſe of ſulphur.

ALL calxes of lead may be reduced into ſolid lead again, by melting with charcoal-duſt and nitre[s].

Sugar of Lead.

TAKE of litharge, red or white lead, what quantity you pleaſe; powder it, and put it into a pewter glaſs or earthen veſſel, and put to it eight times its weight of diſtilled vinegar; an ebullition will appear upon their mixture: ſtir them well about; then ſet them upon a digeſting furnace in ſand; let them ſtand in warmth three or four days, two or three times in a day ſtirring them well with a clean ſtick. When the vinegar has acquired a ſweetneſs, pour off the impregnated vinegar by gentle inclination, and filter it; then put it to evaporate in a pewter baſon, till a film appears upon the ſurface of the liquor; then put it into a glaſs funnel (the ſmall end being ſtopt with a cork) and ſet it in a cool place to ſhoot: when it has ſtood ſo twenty-four hours, pull out the cork, and let the liquor, which is not coagulated, run from the ſugar of lead[t].

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[s] Or more conveniently with what is called the black flux, which is made of two parts tartar and one nitre, powdered and mingled together, and then ſet on fire with a hot iron. Mix one part of this with two of the calx, and flux them in a crucible in a quick fire.

[t] Earthen pans are more convenient to ſet the ſolution of lead to

THIS liquor is called honey of lead, which you may make into ſugar, by evaporation and cryſtallization; or keep to make the balſam or magiſtery, as followeth.

DROP oil of tartar, by diſſolution, into the honey of lead, and a white powder will fall to the bottom; which powder muſt be waſhed ſweet, and kept for uſe: which is the ſame with magiſtery of tin.

THE balſam or butter of lead, is made by mixing the honey of lead with its equal weight of ſallad oil; beat them well together, till they are united in the conſiſtence of a balſam.

IT is uſed in ſcalds and burns. The uſe of the ſugar of lead is now univerſally known. Its doſe internally to half a ſcruple.

ANY of theſe ſaturnine calces will make ſalt; but I have found the flake-lead, as they beat it off the corroded flakes, to ſerve beſt. You may have it at the colour-ſhops for ſix-pence a pound.

PEWTER veſſels are beſt both to evaporate and digeſt the diſtilled vinegar and lead in; earthen veſſels ſuck up too much of the liquor, and in glaſs veſſels it requires more time, and they are in danger of breaking. Beſides, its evaporation in a pewter baſon, makes it ſhoot better into cryſtals.

The

to cryſtallize in than glaſs veſſels, which are apt to be broke on pouring in the hot liquor. If juſt before it is taken off the fire, a ſmall quantity of ſpirit of wine be added, and inſtead of a cool place, a warm cloſe one be choſe for it to cryſtallize in, the cryſtals will be very large and tranſparent.

The balſam of lead, with oil of turpentine.

PUT what quantity of ſugar of lead you pleaſe into a matraſs; put upon it four times (ſome ſay three times) its weight of oil of turpentine; let them ſtand in a gentle heat of digeſtion forty-eight hours, ſhaking them about three or four times a day: in that time the oil will be well tinged; pour it off from what remains undiſſolved, by gentle inclination: put the impregnated oil of turpentine into a retort, and draw two thirds off in a gentle heat of ſand; that which remains in the retort is the balſam, which keep in a vial well ſtopt for uſe.

IT is accounted an excellent medicine for healing and cicatrizing ulcers: it is alſo uſed with good ſucceſs in cancers, they being touched with it once in twelve hours.

The burning ſpirit of lead.

MIX what quantity of ſugar of lead you pleaſe, with three times its weight of fuller's-earth, powder of bricks, or tobacco-pipes clean burnt, and beaten to powder[u]; put them into to a coated retort, of which one third muſt be empty; place it in an open furnace, fit a receiver to it without luting, and make a very gentle fire under it, to draw off the phlegm. When the drops begin to taſte, lute well the joints of the receiver, and increaſe the fire a little, till whitiſh clouds come into it; and as you find the fumes to abate, increaſe the fire to the moſt extreme degree, till no more fumes appear in the receiver; then take off the receiver, and put all the liquor into a clean retort, or a body with its head placed in ſand. Lute the joints well, and make under it a gentle fire, which will drive over its ardent ſpirit in an imperceptible ſubtile vapour; after that will riſe a liquor (a little tinged) which ſome call the yellow oil of Saturn, and will appear in little oblique veins: after that the phlegm will riſe in ſtrait veins, and in the bottom will remain that which is called the red oil of Saturn. Theſe ſubſtances ought to be ſeparated, by changing the receiver in the rectification.

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[u] The fuller's earth, powder of bricks or tobacco-pipes may be omitted, as unneceſſarily taking up room in the retort; for the diſtillation will ſucceed equally as well without them. The burning ſpirit differs but little from ſpirit of wine. Mr. *Lemery* obtained from twelve ounces of ſugar of lead, three ounces and a half of liquor by diſtillation; and upon reducing the caput mortuum, ſeven ounces and a half of lead.

THE burning ſpirit is diaphoretic, and is given in the plague, burning fevers, ſmall-pox, and venereal pox, and in hypochondriac melancholy. Its doſe is from ten to twenty-five or thirty drops.

I mix bole with the ſalt to keep it from melting; ſo it will the better emit its ſpirit.

CHAP. V.

Of IRON.

MARS, or iron, is a foul, imperfect metal, generated of impure mercury and ſulphur, full of earth, and ſtrongly united by the nature of its parts; but wanting fuſibility and weight[w]. However when it is well prepared, it yields many excellent medicines, both for internal and external uſe.

SOME authors are of opinion that ſteel is the better ſubject to work upon, and others give the preference to iron; but I think it is indifferent which we take, ſince ſteel is no other than a concentrated iron. I have uſed them both very often, and never found any difference either in their preparation or operation; only ſteel (by reaſon of its concentration) requires a little more time for its diſſolution.

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[w] The ſpecific gravity of iron is to that of gold, as 7,645 to 19,640. This metal requires a great degree of heat to melt it, when it throws out ſparkles, loſes conſiderably of its ſubſtance, and is at length converted into a dark-blue glaſs. It is by no means miſcible with mercury; nor with lead, unleſs in the form of glaſs: it readily mingles with gold and ſilver in fuſion; and likewiſe with copper and tin, if the neceſſary precautions be obſerved. The vitriolic acid diſſolves it; ſo does the nitrous, and very readily the marine: it is eaſily ſoluble in the vegetable acids; even water itſelf diſſolves it. A bar heated very hot, and applied to ſulphur, runs down into a brittle ſubſtance, from which pure metal is ſcarce ever to be ſeparated. Iron abſorbs ſulphur more readily than any other of the metals,

Preparations of Iron.

Dr. Willis's *Preparation of Steel.*

TAKE clean filings of iron, and cream of tartar in fine powder, of each a like quantity; mix them well, and make them into a paſte, with white-wine. Then ſet it to dry in the ſun, or other gentle heat; break the maſs, and if it has not acquired a greeniſh colour, powder it, moiſten and dry it again, as before.

To clean the file-duſt from the dirt which has accidentally fallen into it, waſh it in ſeveral waters; the dirt will ſwim upon the ſurface of the water, and the clean filings will ſink to the bottom; they are beſt dried in the ſun.

This operation requires nothing but diligent grinding, if there be occaſion to moiſten it a ſecond time.

Crocus Martis Aperiens.

TAKE of filings of iron, what quantity you pleaſe; moiſten them with rain-water, and dry them in the ſun, or at a gentle fire; when they are dry, moiſten them again, and dry as before: repeat this five or ſix times, and the filings will be in a ſubtile powder[x], which is called the opening ſaffron of mars.

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[x] Mr. *Lemery* ſhews a ſimple method of reducing ſteel to a very fine powder, without ruſting it. Put ſteel in filings into an un-

You may expoſe filings of iron to the air, where the dew may fall upon them, and dry them as before: this being repeated fourteen or fifteen times, the mars will be converted into a ſubtile powder, which is called crocus martis.

Rain-water and dew are accounted better to moiſten the filings with, than common water, becauſe they are impregnated with the nitre of the air, which cauſes a better penetration, and is more aperitive.

Both theſe powders are opening, and given with good ſucceſs in the green-ſickneſs, ſtoppage of terms, and in dropſies. The doſe from five grains, to two ſcruples, or fifty grains.

An opening Crocus with Sulphur.

THIS opening crocus is prepared with ſulphur, by mixing equal parts of filings of ſteel, and ſulphur in powder, and burning them in a flat-bottomed earthen or iron pan, continually ſtirring them with a ſpatula, till they come into a ſubtile powder, which will be black, and is ſteel prepared with ſulphur. This prepared ſteel being mixed with more ſulphur, and fired, as before, and continued in agitation, will acquire a ſaffron-colour. Its uſe and doſe, as the former.

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unglazed earthen veſſel; pour water on it, till it is four inches above the filings; ſtir them well every day, ſupplying more water as that in the veſſel ſubſides, ſo that the ſteel remain always covered; continue this operation till the filings fall into an impalpable black powder; then dry it for uſe. *Memoires de l'Acad. des Scienc.* 1735, 1736.

In making this preparation, place the veſſel in a chimney, the better to avoid thoſe offenſive fumes it emits.

A third Aperitive Crocus Martis is thus made.

TAKE the caput mortuum of ens martis; put it into a large crucible, ſet it in a melting furnace, with a good fire about it; keep ſtirring till it has done fuming.

ANY of the aforeſaid crocus's, after being ſprinkled with vinegar, and being reverberated three or four hours, are accounted binding, and are given in diarrhœa's, ſpitting of blood, immoderate hemorrhoids, and fluxes of the menſes. The doſe from fifteen grains to fifty, or one dram.

Crocus Martis Aſtringens.

IT is made by reverberating filings of iron, in the flame of a wood-fire, for ſixteen or twenty hours. Some adviſe to ſtir them once in two or three hours. This is a troubleſome preparation, and after all, is no better than thoſe which went before, and uſed generally for the ſame purpoſes.

Salt, or Vitriol of Steel.

TAKE four ounces of iron nails; ſprinkle upon, or moiſten them with two ounces of oil of vitriol; put them into a matraſs, and let them ſtand a quarter of an hour; then put to them twelve ounces of fountain-water by degrees: when all is in, ſet them in a gentle heat, to ſtand twenty-four hours; then decant and filter the liquor, which muſt be evaporated in an earthen or glaſs veſſel, till you ſee a ſcum appear: then take it from the fire, and if you ſee any yellow powder in the bottom of the veſſel, decant the clear liquor from it, into a wide-mouthed glaſs to be ſet into a cool place, where it may ſtand twenty-four hours, to ſhoot into cryſtals; then pour the liquor from the cryſtals, to be further evaporated; and ſo on, till it all ſhoots into cryſtals[y].

It is uſed in all diſeaſes cauſed by obſtructions. Its doſe from five grains to one ſcruple.

Let the diſſolution of mars for its ſalt be always made in a chimney, for the better conveyance of the unpleaſant ſulphureous fumes which riſe from it[z]; nor fill the veſſel in which you diſſolve it above a quarter full, leſt it ſhould boil over.

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[y] The chemiſts uſually prepare the ſalt of ſteel at a much leſs expence than here directed. For this purpoſe, the common vitriol of iron is well purified by ſolution, filtration and cryſtallization. This, if not allowed as a commendable improvement, may ſurely be looked upon as a venial tranſgreſſion, ſince the two preparations appear not to differ from one another.

[z] The vapour which ariſes in the diſſolution of iron with oil of vitriol is inflammable, and will readily take fire at the approach of flame, and cauſe a great exploſion: particular care therefore is to be taken leſt it ſhould take fire, which would endanger the burſting the veſſel to pieces.

Salt of Steel, by the ſweet Spirit of Vitriol.

TAKE a flat iron pan, turned up at the edges, and put into it ſo much ſpiritus vitrioli dulcis as will fill it two fingers: let it ſtand quietly in ſome warm place, till it is coagulated into a ſalt; then dry it gently, and keep it in a vial well ſtopped. Its uſe and doſe is the ſame with the former.

SOME prepare this ſalt with equal parts of oil of vitriol and ſpirit of wine; but the ſpirit of vitriol dulcified produces a finer ſalt.

Ens Martis.

TAKE filings of ſteel, one pound, ſal armoniac in powder two pounds; mix them well, and put them into a retort, which ſet in a ſand-furnace, and give gradual fire to the fourth degree: when all is ſublimed, let out the fire, and you will have in the neck of the retort, the ſal armoniac impregnated with the ſulphur of ſteel[a].

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[a] This proceſs may be much improved, and the ſal armoniac impregnated with a greater quantity of iron, by increaſing the quantity of ſalt to treble that of the metal; then diligently grind them both together, moiſtening them with a little water, and afterwards gently dry the maſs. The pulveriſation, humectation and gentle exſiccation, are to be repeated four or five times, the oftener the better will the ſublimation ſucceed, which ought to be performed with a quick fire. The moſt convenient inſtrument for this purpoſe is an iron pot, to which may be luted an inverted earthen jar, a ſmall hole being made in its bottom to ſuffer the more elaſtic parts in the compoſition to eſcape. By this method I have, with eaſe, at one ſublimation, elevated ſo much of the iron as to make the ſublimate of as deep a colour as good hepar ſulphuris.

ITS operation is diuretic, and a little diaphoretic. It is accounted a ſpecific againſt the rickets and worms in children; alſo againſt hyſteric fits, and a great opener of obſtructions. Its doſe, from five grains to one ſcruple.

OF ſal armoniac we take two parts to one of mars, the better to penetrate the filings, and make a ſeparation of its volatile ſulphur.

Diaphoretic Steel.

DIſſolve ens martis in a ſufficient quantity of warm water, filter the diſſolution; and by dropping leiſurely oil of tartar per deliquium (or ſpirit of ſal armoniac) into the filtered liquor, a powder will precipitate: let it ſettle, then decant the liquor, and dry the precipitate.

ITS operation is diaphoretic and diuretic, and is given to hypochondriacal perſons, alſo in quartan agues. Its doſe, from ten grains to half a dram.

IN this precipitation of mars, the diaphoretic and diuretic operation proceeds from the particles of ſal armoniac which are mixed with it. Therefore we do not waſh this, as we do other precipitates.

The Tincture of Steel.

TAKE that which remains in the bottom of the retort, after the ſublimation of ens martis; powder it, whilſt warm, in a hot mortar; put it preſently into a matraſs, with ſo much ſpirit of wine as will cover it four fingers high: let it ſtand five or ſix hours in warm ſand, and it will be tinged of a red colour. When it is cold, decant it from the feces, and put it in a glaſs well ſtopped, for uſe.

THIS tincture is ſaid to be a ſpecific againſt worms in children, cachexia, and dropſy. Its operation is diaphoretic and diuretic. Its doſe, from five to fifty drops.

THAT which remains after the tincture is extracted, may be reverberated a little; and made one of the beſt opening ſaffrons of ſteel: but the continuance of its reverberation three or four hours, makes it aſtringent, as it is commonly called.

THIS tincture is alſo impregnated with the ſal armoniac, which makes it operate by urine.

Another Tincture of Steel, and its Sweet Salt.

TAKE half a pound of filings without duſt; put it to one pound and a half of ſpirit of ſalt; let it ſtand upon warm ſand twenty-four hours; then decant and filter the liquor: put to the remaining ſteel, one pound and a half more of ſpirit of ſalt; let it ſtand, as before, twenty-four hours; ſhake it two or three times a-day, and in that time, the ſteel will be almoſt all diſſolved; decant and filter, as before. Put both the filtered liquors into a retort, which place in ſand, and draw off two pound of the liquor; then let the retort cool as ſoon as you can; but before it is quite cold, pour the liquor from the ſediment, into a glaſs, and ſet it to ſhoot in a cold place. Theſe cryſtals will have a ſweetiſh taſte, and by three or four diſſolutions and coagulations in the ſame liquor, they will acquire a very ſenſible ſweetneſs.

SOME there are who make a diſtinction of the parts of iron, affirming that the purer part of it diſſolves firſt, and moſt eaſily in an acid; but I have often tried that experiment, and could never find any ſenſible difference. Moſt corroſives are capable of diſſolving the whole body of mars, but the ſpirit of ſalt more kindly and readily than any other.

THIS is accounted the beſt ſalt of ſteel, and more ſucceſsfully anſwers the intentions of all the reſt, and is more pleaſant for the patient to take. Its doſe is the ſame with the other ſalts.

A third Tincture of Mars.

TO make this tincture, you muſt draw the firſt diſſolution (made by ſpirit of ſalt) to dryneſs, or till ſuch time as the drops which diſtil from it, appear yellow; then, to that which remains, put a quart of diſtilled vinegar, and let it ſtand twenty-four hours in warm ſand; in that time it will be tinged. Then decant that red tincture, and put upon the remainder more diſtilled vinegar; let it ſtand as before, and ſo proceed, till it yields no more tincture; diſtill off the vinegar, to the conſiſtence of a ſyrup, and put to it ſo much ſpirit of wine, as will cover it four fingers: ſet it in warm ſand twenty-four hours, and it will be tinged; decant that tinged ſpirit, and proceed, as long as it will give any further tincture.

WHEN you have done, take all the tinged ſpirits of wine, and put them into a cucurbit; ſet it in a heat of aſhes, and draw off all the ſpirit of wine, except ſixteen or twenty ounces, which will be a deep and clear tincture: put this, when cold, into a vial, well ſtopped.

THIS far exceeds the other tinctures, and is uſed in the ſame caſes and doſe. It is thought to be more penetrating and noble than the foregoing ones, becauſe the mars is purified by three diſſolutions; (viz.) with ſpirit of ſalt, diſtilled vinegar, ſpirit of wine, and in each diſſolution it leaves new feces.

The Tincture of Steel, with Tartar.

TAKE half a pound of ruſt of iron; mix it with twenty ounces of cream of tartar in fine powder; put them into an iron kettle, with eight or ten pints of clean water; ſet them over a fire; cauſe them to boil for eight or ten hours, and ſtir them often, ſtill ſupplying hot water, as it evaporates: then let the mixture ſettle; and whilſt warm, filter it, and evaporate to the conſiſtence of a thin ſyrup, in an earthen pan.

IT is a good aperitive medicine, and given in the ſame caſes the others are. Its doſe from one ſcruple to five, in any proper vehicle.

In this preparation ſome uſe crude tartar, but I rather chuſe cream of tartar, becauſe its groſſer and more earthy parts are ſeparated, and therefore it makes the better penetration into the iron.

" *Styptic Tincture of* Helvetius.

PUT two ounces of *Willis*'s preparation of ſteel into a veſſel made of oak; pour on this one or two gallons of a well-taſted proof-ſpirit, ſtir them together now and then, and when the ſpirit is become of a dark purple colour, it is fit for uſe.

This preparation is directed to be made with *French* brandy, upon the ſuppoſition that the colour for which this tincture is valued could be obtained only with that ſpirit. But the fact is this: foreign brandies by lying long in the caſk, gain a yellow colour from the wood, which is uſually oak; and therefore, like infuſions of galls, tea, oak, and ſuch other ſubſtances, grow of a purpliſh colour, upon the dropping in any chalybeat water, or ſlight ſolution of iron; which does not ſucceed in general with our ſpirits, whoſe colour is owing to burnt ſugar, treacle, *&c.* That this really is the caſe appears from the proceſs above, which will equally ſucceed with any colourleſs and pure ſpirit; and likewiſe from this obſervation, that *French* brandy will not ſtrike this colour if it has not lain long enough in a caſk to extract a tincture."

The Anodyne Sulphur of Steel.

TAKE of the tincture of ſteel, extracted with diſtilled vinegar[b], and drop upon it, either ſpirit of ſal armoniac, or oil of tartar per deliquium, ſo long till you ſee nothing will precipitate; then let it ſtand to ſettle, and decant the liquor, which is of no uſe. Pour warm water upon this precipitate, and when ſettled ſhake it: decant that water and put on more; and ſo proceed till the ſulphur[c] has no ſalt taſte; then dry it gently, and keep in a vial well ſtopped, for uſe.

Its operation is ſudorific and anodyne, and is ſucceſsfully uſed in the gout, rheumatiſm, ſcurvy, all fevers, and the ſmall-pox.

In this precipitation of mars, the diaphoretic and diuretic operation proceeds from the particles of ſal armoniac[d].

The opening extract of Steel.

TAKE of any of the aforeſaid opening crocus's, four ounces; of the juice of apples, (ordered as followeth) four pound; put them in an iron pan, in a gentle heat of digeſtion in ſand, ſix or ſeven hours; augment the heat in ſuch manner, that it may boil very gently three or four hours: ſtir it every quarter of an hour with an iron-ſlice; and when you perceive it to be black, take it from the fire, and let it ſtand to ſettle a little: whilſt warm, pour it through a ſtraining-cloth, and by gentle evaporation bring it to the conſiſtence of an extract.

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[b] See p. 58.

[c] This preparation cannot with any degree of propriety be called ſulphur, ſince it is no more than a crocus of iron greatly attenuated.

[d] If the virtue of this preparation be ſuppoſed to proceed from the regenerated ſal armoniac, the repeated ablutions with water are highly improper, ſince by this means the ſalt is entirely waſhed away.

It is endued with the ſame virtues other opening chalybeats are. Its doſe is from half a ſcruple to one or two drams.

You muſt put half a pound of tamarinds bruiſed, to four pound of the juice of apples, and mix them well in an iron mortar; let them ſtand twenty-four hours in a gentle heat of ſand; then ſtrain it through a cloth, for the uſe aboveſaid.

The binding extract of Steel.

TAKE of the binding crocus martis, four ounces; put to it of red port wine (wherein half a pound of the pulp of ripe ſloes has been mixed and digeſted, as in the opening extract) four pound: proceed in every thing as in the other extract, and you have that which they call the binding extract of ſteel.

It is given in bloody-fluxes, looſeneſs, and immoderate courſes.

The deepeſt red wine you can get, is beſt for this preparation. The aſtringent quality of the ſloes does much increaſe the virtue of this medicine.

Notwithstanding all thoſe preparations which are commonly called aperitive, there are ſome who will not allow any preparation of mars to be truly ſuch; but that meeting with their proper acid in great quantity, as in diſeaſes of the liver and ſpleen, they become opening, and ſometimes violently purging [e].

The martial Stiptic Water.

TAKE of our lapis medicamentoſus two ounces; reduce it into a fine powder; put it into a matraſs: pour upon it a pint of ſpring-water; ſet it in a gentle heat twenty-four hours; ſhake it two or three times, decant it. To every four ounces of this clear infuſion, add one ounce of our tincture of mars, and keep it for uſe.

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[e] Dr. *Stahl* deſcribes a method of making two different preparations from ſteel; the one, he ſays, is manifeſtly aperitive; and the other manifeſtly aſtringent. As his method is ſomething ſingular, we ſhall inſert it. Take a pound of antimony, and half a pound of iron filings or nails: heat the nails red hot in a crucible; and then inject upon them the antimony in powder: when they are melted, add two ounces of fixed alkaline ſalt, made perfectly dry and hot. When the whole mixture is in thin fuſion, pour it out into a heated cone: on the top, you will find a ſcoria eaſily ſeparable from the regulus of antimony at the bottom. Expoſe this ſcoria to the air, and it will fall into powder; ſeparate the finer parts by water, dry, and mix them with double their weight of nitre, and inject them into a crucible: after the deflagration is over, take the matter out, and edulcorate it with water, and you will have a crocus of a pale red colour, which is very aperitive. If the groſſer powder which was ſeparated from this by water, be treated with nitre in the ſame manner, you will have a dark purple powder, which is very aſtringent. See *Stahl. opuſc. chymico-phyſico med.* p. 523.

It cicatrizeth without pain: the more it is known, the more it will be uſed. It is made ſtronger or weaker by a greater or leſs quantity of tincture of mars.

Tinctura Antiphthiſica.

TAKE ſalt of ſteel, and ſaccharum ſaturni, of each four ounces; put them into a matraſs with a quart of good *French* brandy: let it digeſt twenty hours, and you will have a beautiful tincture.

It is a ſpecific in hectic fevers, and opens obſtructions in women. The doſe from five to fifty drops.

The red Flowers of Mars.

DISSOLVE filings of ſteel in ſpirit of ſalt; filter the diſſolution; put it into a retort placed in a ſand furnace: draw off the ſpirit, till the drops come yellow; then change the receiver, and increaſe the fire to the fourth degree. Keep it ſo till the drops ceaſe, and no more fumes appear in the receiver. When all is cool, you will find a volatile ſulphur, or flowers of ſteel, in the neck of the retort[f].

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[f] Upon performing this proceſs, we found the ſteel to be altered in the manner deſcribed by Mr. *Boyle* (in his uſefulneſs of Natural Philoſophy): there were three ſubſtances ſublimed: the firſt was almoſt like a powder, which grew of a yellow colour upon being expoſed to the air; the ſecond was of a deeper colour, between red and brown; but the third, which ſeemed the largeſt of all, was of a deep reddiſh colour, and gliſtened like the ſcales of fiſhes. The caput mortuum looked like talc, conſiſting of thin gloſſy plates.

IF you put half an ounce of theſe flowers into four ounces of ſpirit of wine, you will have a clear and pleaſant tincture. The doſe from ten to fifty drops.

YOU may keep the flowers, if you quickly ſcrape them from the neck of the retort, and put them in a vial, and ſtop it cloſe. If you expoſe them to the air, they will run into a blood red oil. Both the flowers and oil are great ſtyptics.

Elixir Martis.

PUT four ounces of the caput mortuum (after raiſing the red flowers of mars) into a flat pan; expoſe it to the air, and it will run into a red liquor. Take of this liquor, of the tinctures of myrrh and ſaffron, tartarized ſpirit of wine, of each a like quantity.

Purging Salt of Mars.

TAKE filings of ſteel, ſal armoniac, and flowers of ſulphur, of each one pound; grind them well together, and put them into a wormred crucible, ſpoonful after ſpoonful; keep them ſtirring with an iron rod, till the blue flame diſappears. With warm water extract the ſalt from the crocus; evaporate the water, and keep the ſalt for uſe. The doſe from ten grains to two ſcruples.

Tincture of Mars, with Sal Armoniac.

TAKE half a pound (throughly dryed) of the maſs that remained, after making the tartarized martial tincture; add to it, as much ſalt-petre and ſal armoniac, and two ounces of flowers of ſulphur: let them be well mixed and powdered; then put them gradually into a red-hot crucible; keep them in fuſion a full hour; take the maſs from the fire, and reduce it to a fine powder, which put quickly into a matraſs, and pour upon it a quart of tartarized ſpirit of wine. Digeſt it in a gentle heat two or three days, and extract a tincture. The uſe and doſe, the ſame with other martial tinctures[g].

Another Tincture of Mars.

TAKE half a pound of filings of ſteel; put to it (by little and little) ſpirit of nitre four ounces; preſently after, add oil of vitriol, three ounces: ſtir them with an iron ſpatula, till they come to a grey powder; then add (by two or three ſpoonfuls at a time) twelve ounces of ſpring-water; ſtir it well, and put alſo (by degrees) into it, ten ounces of ſpirit of wine. Shake the veſſel, and let it ſtand in digeſtion twenty-four hours, and you will have a ſtrong deep tincture, that will neither precipitate, nor grow muddy. The uſe is the ſame, but the doſe ſomething leſs than the former.

TAKE care the veſſel be large enough.

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[g] This tincture may be as well made by pouring a quart of the tartariſed ſpirit of wine, (a lower ſpirit is preferable) on the caput mortuum of ens martis.

Epileptic Spirit of Steel.

TAKE *Hungarian* or *Roman* vitriol, *French* verdegreaſe, clean filings of ſteel, of each one pound; mix and powder them well; put them into a glazed earthen pan; pour a gallon of hot water upon them, and ſtir them: when cold and ſettled, decant the liquor. To the matter in the pan, put two quarts more of hot water; ſtir and decant as before; put the impregnated waters together, and evaporate half: then with a lixivium of tartar, precipitate the ſulphur, or oker of the vitriol and ſteel; edulcorate it with hot water, and dry it. Put this ſulphur into a matraſs; to each ounce of which, add half a pound of ſweet ſpirit of verdegreaſe. Let it ſtand in digeſtion fifteen days, ſhaking the matraſs two or three times every day; afterwards let it ſettle, and decant it for uſe. The doſe from five to fifty drops.

SWEET ſpirit of verdegreaſe is made of equal parts of ſpirit of wine, and ſpirit of verdegreaſe diſtilled together, as the ſweet ſpirit of nitre.

CHAP. VI.

Of COPPER.

VENUS, or copper, is a metalline body, foul, imperfect, and generated of an impure mercury: its ſulphur is earthy, combuſtible, and of an obſcure red; it wants fixation, purity, and weight:

but if handled by an expert artiſt, is of great uſe both for internal and external medicines [h].

Purification of Copper.

TAKE plates of copper, of the thickneſs of a ſhilling, lay them *ſtratum ſuper ſtratum*, with powder of ſulphur in a large crucible; let the firſt and laſt lays be ſulphur: put them in the arch of a glaſs-maker's furnace twelve hours; then take them out, and when they are cold, ſcrape off what is calcined. The reſt of the plates, which the ſulphur has not penetrated, may be again ſtratified and calcined as before. This calcined copper is called *æs uſtum* [i].

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[h] The ſpecific gravity of copper is to that of gold, as 9,000 to 19,636. Copper is ſofter and more ductile than iron, and melts with a leſs degree of heat: expoſed for a length of time to the vehement action of the fire, it turns into a dark reddiſh aſh, and at length, in a very intenſe heat, to a dark red and almoſt opaque glaſs. It very difficultly amalgamates with mercury. In fuſion it mingles with ſilver and gold, giving them a degree of hardneſs, which fits them for common uſes: it mingles likewiſe with all the other metals. It is ſoluble, but with different degrees of facility, in all acid menſtruums, and likewiſe in the alkaline ones. It melts immediately with ſulphur into a black brittle maſs. It readily imbibes lapis calaminaris; and with it, is converted into braſs. Lead or antimony deſtroy it. Arſenic gives it a white colour ſomewhat reſembling ſilver, but makes it extremely brittle. Zinc turns it of a golden colour, leaving it ſomewhat ductile.

[i] Copper may be calcined with ſulphur, or turned into æs uſtum in a more expeditious manner, by heating a bar of it till it

If you would reduce it into copper again, take the *æs uſtum*, and heat it red hot in a crucible, and caſt it into an earthen pan, wherein linſeed-oil is; cover it preſently to hinder it from flaming; let it lie in the oil till it is pretty cool; then take it out, and heat it red-hot, and quench it as before: do this nine or ten times, every third time putting new oil. Then take the copper, which looks very fine, and with charcoal-duſt, and borax, put it into a crucible; and ſet it in a melting furnace, give it a ſtrong fire of fuſion, till it is well melted, then caſt it into an ingot.

Another Purification of Copper.

STRATIFY plates of copper with common ſalt in a crucible; calcine it in a glaſs-houſe fire, as you did the other; ſcrape off all that is calcined, and the remaining plates ſtratify and calcine, as before: then mix this calcined copper with charcoal-duſt, and borax, put it into a crucible, and with a very ſtrong fire, in a melting furnace, reduce it into a body, which you may either let cool in the crucible, or caſt into an ingot that is heated and greaſed[k].

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it ſparkles, and then applying it to a roll of brimſtone over a pail of water, into which it will run in a ſtream.

Or the buſineſs may be performed with great eaſe, by mixing filings of copper with four times their weight of powdered ſulphur, and throwing them, by a ſpoonful at a time, into a large crucible heated red hot; by which means, the maſs will ſoon boil up, and appear highly ignited: when it grows dull, it may be taken out, and a freſh parcel thrown in.

[k] When copper is melted, the utmoſt care ought to be taken that

Such ſalt or ſulphur, as lies looſe, keep apart, and only ſcrape off ſuch as ſticks to the plates.

" *Amalgamation of Copper.*

THE amalgamation of pure copper is extremely difficult; but the buſineſs may be effected by taking it, when its particles are divided by lapis calaminaris, as in braſs. Take filings of this metal: heat them in a crucible; and then put them into ſix times the weight of hot mercury in a hot iron mortar: triturate them with a warm peſtle for a conſiderable time: when you perceive the mercury to have taken hold of the metal, pour on ſome water, which will grow turbid: decant this from the amalgam, and pour on freſh: continue the triturations and ablutions, till the water comes off clear. The water, upon ſtanding will depoſite a ſediment, which is the lapis calaminaris that had been united with the copper, when it was changed into braſs. There is another method of amalgamating copper with quickſilver, which may be performed with greater eaſe and expedition. Grind ſix ounces of verdegreaſe with as much common ſalt: boil the mixture in an iron pan with ſome vinegar and water, and add to it four ounces of mercury. Keep continually ſtirring the whole together with an iron ſpatula; adding more water and vinegar, as the

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that the veſſels or moulds into which it is poured, be not cold, and perfectly dry, for the leaſt moiſture, from its ſudden rarefaction, may occaſion terrible accidents, which have but too frequently happened for want of this neceſſary precaution.

the firſt boils away, till the quickſilver is no longer fluid, but ſticks to the ſpatula and the bottom of the pan; which, if the operation be diligently attended, will ſucceed in half an hour. Grind the maſs in a mortar with water, pouring it off when it grows turbid, and adding freſh, till the amalgam appears bright and ſhining. This amalgam being kept expoſed to the air for ſome time, grows hard and brittle."

Cryſtals, or Vitriol of Copper.

DISSOLVE the aforeſaid copper in aqua fortis, or ſpirit of nitre: to one part of copper, you muſt put three parts of ſpirit of nitre, by little at a time[1]. Put the diſſolution upon warm ſand, and evaporate one half; ſet that which remains in the cucurbit, in a cold place to ſhoot into cryſtals: the liquor which remains may be evaporated as the former, and again ſet to ſhoot. Dry the cryſtals between paper, and put them in a vial ſtopped from the air. They are a good cauſtic to conſume proud fleſh.

DISSOLVE the copper, and evaporate the diſſolutions always in a chimney, to avoid the noxious fumes.

Other Cryſtals of Copper and Verdegreaſe.

TAKE of verdegreaſe in powder, one pound; put it into a matraſs, with four pounds of diſtilled vinegar; ſet them upon warm ſand the ſpace of three or four days, ſtirring them about three or four times every day. When it is well ſettled, pour off the blue liquor by inclination, and put new diſtilled vinegar to that which remains undiſſolved, and keep it in the heat again two or three days, ſtirring it about as before; and if the ſecond extraction be as blue as the firſt, pour it off by inclination, and put two pounds more of diſtilled vinegar upon that which remains in the cucurbit, uſing the ſame method as before. This third extraction will take all that is diſſolvable[m]. This done, put all the impregnated waters together, and filter them; put them in a clean cucurbit, and evaporate one half of the liquor; then take it from the fire, and before it is quite cold, decant it into a clean veſſel, from the feces (which ſometimes fall in the evaporation) and ſet it in a cool place, where it may ſtand forty eight hours, to ſhoot into cryſtals. Pour the remaining liquer from the cryſtals, and evaporate again, and ſhoot into cryſtals, as you did before.

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[1] It is more convenient to put the copper to the menſtruum, by little and little at a time.

THIS is called diſtilled verdegreaſe, and is more uſed by painters than by phyſicians; it is very deterſive, and is ſometimes uſed externally.

Spirit of Verdegreaſe.

TAKE the cryſtals of verdegreaſe, with which fill a retort half full; place it in ſand, giving it a gentle fire till the phlegm is diſtilled. As ſoon as you

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[m] If what remains undiſſolved be mixed with ſome borax and lin-

you perceive the drops to be acid, change the receiver, and lute it well with bladder; then increaſe the fire, and the receiver will be filled with fumes when you perceive theſe fumes to decreaſe, augment the fire, and at laſt lay kindled coals round the neck of the retort, and keep up the fire to the higheſt degree, till the fumes ceaſe, when the receiver grows cool: then take off the receiver, and put the ſpirit into a clean retort, and rectify it in a gentle heat of ſand; put it out of the recipient into a bottle, and ſtop it cloſe[n].

IT is accounted a good medicine in the palſy, epilepſy, and apoplexy; and is alſo a good menſtruum to diſſolve pearl and coral. The doſe is from five to twenty-five or thirty drops in a convenient vehicle.

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linſeed oil, and then fluxed in a crucible, it will yield a brittle regulus of a whitiſh colour.

[n] The quantity of acetous liquor will be about one half the weight of the cryſtals employed. This method *Boerhaave* employs for dephlegming vinegar, and directs the aqueous parts to be ſeparated in the diſtillation, by changing the receiver as ſoon as the acid ones begin to riſe. He commends this as the pureſt and ſtrongeſt ſpirit of vinegar, which can be obtained by art; and verdegreaſe as the only medium proper for the purpoſe: but, upon ſmelling and taſting this liquor, it appears to differ pretty much from the pure acetous acid, which may be obtained by congelation, or by another proceſs deſcribed under the article vinegar. It probably partakes of ſome cupreous particles, which have been greatly ſubtilized during their converſion into verdegreaſe, and are now elevated by the force of fire neceſſarily employed in this proceſs.

To make the ſpirit of verdegreaſe, always chuſe the cryſtals, for crude verdegreaſe being mixed with ſome parts of the grapes with which it is corroded, ſends forth an oilyneſs, from which the ſpirit is not eaſily ſeparated by rectification.

The Crocus of Copper.

LET the caput mortuum of the ſpirit of verdegreaſe be beaten to fine powder, and in an unglazed pot reverberated for ten or twelve hours, often ſtirring it with an iron rod; then waſh off the moſt ſubtile powder from the groſs. Dry it, and put it up for uſe.

ITS operation is diaphoretic and diuretic. It ſtops bleeding, both internal and external. It is anodyne, and ſucceſsfully uſed in gonorrhæas, by injection. It is alſo good againſt looſeneſs of the belly, and dyſenteries. Its doſe is from five to twenty grains.

SOMETIMES the reverberation of the crocus is as well performed in five or ſix hours, as it is in twelve hours, according to the diligence uſed in keeping up the fire, and ſtirring the matter.

The Tincture of Copper.

TAKE of the reverberated crocus, before it is waſhed, four ounces; put it in a matraſs with ſpirit of ſalt, twelve ounces; ſet it upon warm ſand, to digeſt, forty-eight hours; (ſhaking it about three or four times a-day) in which time, the ſpirit will receive a red tincture: decant the tincture; put upon the copper half a pound of new ſpirit of ſalt; digeſt and ſhake it, as before; put the tinged ſpirit into a clean retort, and draw to a dry bottom, in the ſecond degree of ſand-heat. To that which remains in the bottom, put diſtilled vinegar, twelve ounces; digeſt, and agitate as in the former digeſtion; you will have a red tincture, which pour off by gentle inclination: put to that which remains, half a pound more of diſtilled vinegar, and digeſt, as before; then put the tinctures together, and filter them. Put the filtered liquor into a clean cucurbit, with its head and receiver; ſet it in ſand, and in the ſecond degree of fire, let it be drawn to the conſiſtence of honey; then put to it twelve ounces of tartarized ſpirit of wine. Let this digeſtion be made in a circulatory or double veſſel, well luted; give it forty-eight hours digeſtion, with the ſame agitation as formerly: decant the tinged ſpirit of wine, and put on more; and ſo do, till it will extract no more tincture. Put all the tinged ſpirits into a clean cucurbit; and in a gentle heat of ſand, draw all off, to about eight ounces, which put into a vial, well ſtopped, for uſe.

Its operation is diaphoretic: it is given in all diſeaſes of the head, in fevers, ſmall-pox, and the venereal pox. Its doſe is from ten to fifteen drops.

All the feces from which you have drawn the former tinctures, you may ſave, and reduce them into very fine copper, in a ſtrong fire, with nitre, charcoal-duſt and borax.

Sulphur of Copper.

DISSOLVE copper in aqua fortis, or ſpirit of ſalt; filter the diſſolution; precipitate the ſulphur with oil of tartar per deliquium. When ſettled, decant the liquor, waſh the precipitate with warm water, till it is inſipid; then dry it for uſe.

CHAP. VII.

Of MERCURY.

MERCURY is no other than a mineral, or a metallic water or liquor, agreeable to all metals, as their mother, but more cloſely adhering to gold, than to any other, by reaſon of its purity; and philoſophically opened, yields the true metalline menſtruum, *&c.*°

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° Quickſilver is the moſt heavy of all fluids, totally volatile in the fire, and incongealable by any degree of cold hitherto known. Its gravity compared with that of ſpirit of wine, the lighteſt of all fluids, is as 14,000 to 866; it comes the neareſt in weight to lead, to which it is as 14,000 to 11,325. By bare agitation alone in a glaſs veſſel, or by being expoſed to a ſmall heat, it yields a ſoft black powder, of a ſharp braſſy taſte: a greater degree of heat changes mercury into a heavy, ſhining, red, friable powder, of a ſharp nauſeous taſte. The black and the red powder may be revived into fluid mercury by a more intenſe heat. Quickſilver amalgamates with gold, ſilver, lead and tin; with copper not ſo eaſily; with zinc and biſmuth imperfectly; but has not been yet found to act on iron or regulus of antimony. Mercury is ſoluble in all the mineral acids, with greater facility in one than another: vinegar and the acids extracted

It is ſometimes to be found running in the veins of the earth, in the perfect form of quickſilver; but much the greater quantity of it is drawn from a mineral ſtone called natural cinnabar[p]. The vivification of it into running mercury, I ſhall give in one of the following proceſſes.

Purification of Mercury.

It is ſeparated from ſuch dirt as has accidentally fallen into it, by forcing it through a clean cloth, or leather: it is better cleanſed by grinding it with ſalt and vinegar, and waſhing it with warm water, and continuing ſo to do, till it blackens not the ſalt or water[q]. But there is yet a better way of purifying it, by putting what quantity of it you pleaſe

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tracted from vegetables have no effect upon it: neither have alkaline or neutral ſalts: the nitrous acid readily diſſolves it into a pellucid liquor: neither the marine or vitriolic acid act upon it, unleſs highly concentrated. It readily joins to ſulphur, and ſublimes along with it into a red powder; from this it is eaſily ſeparable by abſorbent earths, fixed alkaline ſalts, regulus of antimony, and all the metals, except gold.

[p] It is likewiſe found in a hard ſtony ore of the colour of crocus metallorum; ſometimes in a ruddy earth ſtreaked with black, and ſometimes in a dark coloured earth inclining to red. There are conſiderable mines of it in Friuli, others in Hungary and Spain; but we receive the greateſt quantities from the Eaſt Indies.

[q] When mercury is adulterated with lead, biſmuth, or the like ſubſtances, the abuſe may be diſcovered by the addition of vinegar, which will acquire a ſaccharine ſweetneſs upon being rubbed or boiled with it.

pleaſe into a retort, with equal its weight of ſalt of tartar, and the ſame weight of quicklime upon it; place it in a ſand furnace, and give a gradual fire, till it is diſtilled into the receiver. Some fill the receiver half full of water; but this gives an unneceſſary trouble, becauſe the mercury comes not over in fumes, but drops out of the neck of the retort into the receiver[r]. If you repeat this three or four times, it makes the mercury extreme bright, and pleaſing to the eye, and frees it from all its foul external ſulphur. It is alſo well purified by vivifying it from ſublimate, cinnabar, or an amalgama of gold or ſilver.

Artificial Cinnabar.

TAKE of ſulphur one pound, melt it under a chimney in an earthen pan[s], ſo as it may be juſt fluid, then put to it by little at a time, three pound of crude mercury[t], ſtirring them till no mercury appears[u], then let them cool: powder the mixture, and put it into an oval bolt-head [w] luted, place it over a naked fire, which increaſe gradually to the fourth degree, and the cinnabar will be ſeparated in a cake above the feces [x].

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[r] The uſe of water is not to condenſe the mercury, but to cool it, leſt falling hot upon the bottom of the recipient, it ſhould break.

[s] An iron pot, or ladle is preferable.

[t] This proportion of ſulphur to the mercury is too great, and not only occaſions an unneceſſary trouble and expence, but likewiſe makes the cinnabar of a bad colour. One pound of pure flowers of ſulphur will eaſily take up three pounds and a half of mercury, and artfully managed, a much larger quantity.

[u] At this time a conſiderable exploſion frequently happens, and the mixture takes fire, eſpecially if the operation be ſome-what

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what haſtened. This phænomenon is probably owing to the ſudden rarefaction of the water, which is frequently contained, and in no little quantity, in mercury as it comes to our hands.

[w] Whatever veſſel be made uſe of for this purpoſe, great care ſhould be taken, that the matter ſublime not up into the neck, ſo as to block it up; for if this happens, it will ſoon burſt to pieces, to the certain loſs and hazard of the operator. A wide-necked bolt-head, or rather an oval earthen jar coated, ſhould be employed in this operation; either of which ſhould be ſo placed in the furnace, as that the fire may not puſh the cinnabar too high. If a bolt-head be uſed, it is convenient to introduce, at times, an iron-wire ſomewhat warmed, in order to be the better aſſured that the paſſage is not blocking up, the danger of which may be prevented by cautiouſly raiſing the veſſel ſomewhat higher from the fire.

[x] If the mercury and ſulphur be pure, and their quantities duly proportioned, no feces will remain: in ſuch caſe, the ſublimation may be known to be over, by feeling the bottom of the veſſel with a wire, which will then be perfectly ſmooth: but if any roughneſs or inequalities are perceived, it is a ſign that either the mixture was impure, or the ſublimation is not completed; if the latter, the lower end of the wire will ſoon be covered over with the riſing cinnabar.

If cinnabar be deſigned as a pigment, great care ſhould be taken to give it as bright and lively a colour as poſſible. This depends upon uſing but little ſulphur and a quick fire. If after the æthiops is made, it be gently calcined on an iron plate, with a ſoft fire, ſtirring it all the time, a conſiderable quantity of crude ſulphur may be evaporated: if then the mixture be ſublimed, it will yield a much purer and finer coloured cinnabar

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The Vivification of Cinnabar.

TAKE of cinnabar one pound, calcined tartar, or pot-aſhes, one pound, quicklime two pounds; grind them well together, and put them into a retort, leaving at leaſt one part in three empty. Place it in a reverberatory furnace, and fit a receiver; let it ſtand twelve hours, and then kindle the fire, increaſing it gradually to the fourth degree; keep it ſo till the mercury is raiſed into the neck of the retort and receiver, which will be in ſeven or eight hours time. Then put all the mercury into a clean diaper napkin, placed over a clean earthen diſh, and ſqueeze it through to ſeparate from it any heterogeneous matter that may have aſcended in the diſtillation.

It is alſo revived by mixing cinnabar, one pound, with one pound and a half of filings of iron, and diſtilling as before[y].

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than can be otherwiſe obtained. *Hoffman* gives a curious method of making cinnabar without ſublimation. (See his *Obſervat. phyſico-chym.* 4to. p. 250.) It is by ſhaking or digeſting a little mercury in volatile tincture of ſulphur, the preparation of which ſhall be given under the article ſulphur.

[y] The method of reviving cinnabar from filings of iron, is more facile and commodious than that with earthy ſubſtances, or fixed ſalts. The filings of iron ſhould be free from ruſt, and one half of the weight of the cinnabar is ſufficient: the mixture ſhould be well ground before it is put into the diſtilling veſſel: the fire may be immediately applied, and gradually increaſed till the mercury ceaſes to drop from the noſe of the retort. Sixteen ounces of cinnabar, upon revivification, will yield about thirteen ounces of mercury.

THE mixture is left twelve hours without fire, to give the calx time to ſwell gradually, which otherwiſe might endanger cracking the retort; and alſo that the alcalical ſalt may have mortified the acid ſulphureous ſpirit, by which the mercury was coagulated: which done, the mercury will ſeparate more eaſily. As for putting water into the receiver, it is a trouble to no purpoſe; for I have ſeveral times revived mercury from an amalgama of cinnabar, ſublimate and precipitate, without one drop of water in the receiver.

" *Mercurius præcipitatus per ſe.*

TAKE ſome perfectly pure mercury: heat it in an iron ladle, till it begins to ſmoke, in order to evaporate any ſuperfluous moiſture that may poſſibly be in it: when it is cooled, put as much of it into a matraſs with a flat bottom as will juſt cover it; place it in a ſand furnace, and gradually increaſe the fire till the mercury begins to ariſe in fumes in the glaſs. Continue this degree of fire without intermiſſion, till all or the greateſt part of the mercury, is changed into a red powder[z]."

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[z] This proceſs is exceeding tedious, and requires ſeveral weeks continual fire to be completed in. It ſeems exceedingly probable that it may in ſome meaſure be expedited by making uſe of a tall body with a flat bottom and a wide mouth, inſtead of the glaſſes uſually applied to this purpoſe; for by this means, the free acceſs of the air, which has a remarkable ſhare in the calcination of other metallic ſubſtances, will be admitted to the mercury.

The corroſive ſublimate of Mercury.

TAKE of quickſilver ſeventy pounds; of corroſive ſublimate five pounds; of common ſalt, and nitre[a], of each fifty pounds; of rubified vitriol one hundred pounds, of caput mortuum of aqua fortis twelve pounds and a half. The mercury ſublimate, common ſalt, nitre, caput mortuum, and rubified vitriol, made into fine powder, and kept each by themſelves, are to be mixed as followeth: the quickſilver and ſublimate muſt firſt be mixed with about a quarter part of the ſalts, in a convenient veſſel, by agitation. This mixture will grow moiſt[b], and part of the quickſilver will incorporate with the ſalts. Proceed putting in the ſalts (by a quarter part at a time) till all is in, continually ſtirring, till no part of the quickſilver appears in a running form; then put to it the caput mortuum, which will a little thicken it. When theſe ingredients are equally and well mixt, they will become pretty dry, and then you may agitate them through a ſieve: and laſt of all, mix the ſifted powder, and rubified vitriol. Put this mixture, in equal proportions, into four ſubliming glaſſes; (the figure of which, with the furnace, you will ſee in the beginning of this treatiſe:) place them in

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[a] The nitre ſeems to be of little or no uſe in this preparation: it would be extremely well worth while therefore, in order to ſave room in the veſſel and expences, to try whether this proceſs will ſucceed without it.

[b] If the quantities of the ingredients are but ſmall, this phænomenon does not happen.

in aſhes[c], fit heads and receivers to them, and give a gentle fire for twenty-four hours, in which time the mercury will be diſſolved, and an aqua fortis will diſtil into the receivers. After that, increaſe the fire, and keep it in continually, till you perceive the ſublimate to riſe in the veſſel above the aſhes, ſeparated from the caput mortuum, in form of a cake[d], which commonly happens about the fourth or fifth day. When all is cool, carefully remove the glaſſes from the aſhes, and take out the cake of ſublimate, which keep for uſe.

THE mixture of crude mercury, ſublimate, ſalt, and nitre, becomes moiſt, and of a pappiſh ſubſtance; to which, if you put the rubified vitriol, it would preſently grow hard as a ſtone, which would be very troubleſome to reduce again into powder: but the caput mortuum of aqua fortis, or (if you have it by you) ſome caput mortuum of mercury ſublimate, anſwers the ſame end, and brings the mixture to a temperate dryneſs, which by agitation comes into a powder of itſelf. With this powder the rubified vitriol may conveniently be incorporated, and the operation ought always to be performed in a chimney, to avoid the nitrous fumes which are very ſuffocating. You may make the compoſition in any quantity your occaſion requires; the leſs your quantity of mixtures, the leſs time and fire will finiſh the operation[e].

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[c] So that the matter contained in the glaſſes may be level with the aſhes on the outſide.

[d] If this proceſs be performed with ſmall quantities of the materials, and the ſand or aſhes riſe no higher than their ſurface, the ſublimate will lie on the top of the caput mortuum in a ſoft, light fleecy cake; but if the ſand be brought higher up the ſide of the veſſel, it will aſſume a ſolid cryſtalline form. This gives a uſeful hint for the conducting this part of the proceſs in the larger works.

To make Corroſive Sublimate, in a ſmall quantity.

TAKE two pounds of ſpirit of ſalt, one pound of ſpirit of nitre, put them upon two pounds of crude mercury in a retort; place the retort in a ſand furnace, and fit a receiver to it, then give a gradual fire to the third degree. In eight or ten hours you will find two pounds and a half of ſublimate in the neck of the retort. The ſpirit that comes off will (if you add a third part of ſpirit of wine [f]) ſerve again for the ſame operation.

If you deſire to make mercury ſublimate in a ſmall quantity, diſſolve one pound of crude mercury

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[e] This manner of preparing corroſive ſublimate requires large veſſels, and is ſufficiently tedious and laborious; and, unleſs the fire be well managed, no little part of the ſublimate will remain in the caput mortuum. It may be managed to more advantage, by firſt corroding the mercury with the vitriolic acid, then mingling it with an equal quantity of common ſalt, and ſubliming it in proper veſſels. *Stahl* is ſaid to have made ſublimate in this manner with very little expence or labour.

Mercury ſublimate gains, according to *Tachenius*, two parts in nine, from the common ſalt uſed in the preparation.

[f] I ſuſpect there is ſome miſtake here, and that ſpirit of ſalt is meant inſtead of ſpirit of wine.

cury in eighteen or twenty ounces of ſpirit of nitre: diſtil off that ſpirit, break the glaſs, and take out the maſs; beat it into powder in a glaſs or marble mortar, and afterwards, take of vitriol calcined and powdered[g], and common ſalt, *ana* one pound; grind them all well together; fill a matraſs not above half full, and ſet it on a ſand furnace: increaſe the fire gradually to the third degree, and the ſublimate will all ariſe in ſeven or eight hours[h].

Mercurius Dulcis, or Sweet Sublimate.

TAKE of corroſive ſublimate one pound, to which add of purified quickſilver twelve ounces; grind them well together in a ſtone mortar, with a glaſs or wooden peſtle, till no quickſilver appears. Then fill one third part of a bolt-head with the mixture, ſet it in a ſand-furnace; let the ſand lie half an inch thick between the bottom of the bolt-head and the kettle, filling it up with ſand within an inch of the neck: ſtop the mouth of the glaſs with a little paper, or cotton-wool; then give fire of the firſt degree two hours; increaſe it to the ſecond, in which keep it three hours; go on to the third degree, three hours more, and in that time the ſublimation will be performed. Take it out when cold, and wipe the ſand and dirt from the bolt-head; break the glaſs over a clean ſheet of paper, and ſeparate the ſublimate from the light flowers at the top, and the duſt which lies in the bottom. Afterwards, powder this groſly, and repeat the ſublimation the ſecond and third time[i]. If you ſub-

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[g] The calcined vitriol may be omitted. In the *Edinburgh* Pharmacopœia this proceſs is directed in the following manner. "Take of the calx of mercury prepared with aqua fortis, and of decrepitated ſea ſalt, equal parts; powder and mix theſe well together; put them in a glaſs which may contain double the quantity; place it in a ſand-furnace. Apply at firſt a ſmall heat, which gradually increaſe, till the ſublimate ariſes to the upper part of the glaſs, in a white cryſtalline maſs."

[h] *Lemery* ſays, that a pound of mercury treated thus, will yield nineteen ounces of ſublimate.

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[i] The proceſs in *Lemery* is the ſame with this; and he informs us, that upon the third ſublimation, he had twenty-ſix ounces and a half of mercurius dulcis.

The notion that repeated ſublimation, by the ſimple act of triture, wears away and breaks the points of the ſublimate, upon which depends its corroſiveneſs, is erroneous; for if this was true, ſublimate corroſive itſelf would become mild, barely by repeating the operation. The only method of dulcifying ſublimate is, to add ſo much mercury to it, as may entirely ſatiate the acid ſpirit of ſea-ſalt contained in it: triture, digeſtion, and ſublimation, are neceſſary operations to perform this effect, as they facilitate the combination of a ſufficient quantity of mercury with the acid. But as different corroſive ſublimates differ greatly as to the quantity of acid they contain, it is more prudent to increaſe the quantity of the mercury, and not to ſeparate it, if any ſhould appear diſtinct on the firſt ſublimation, but to endeavour to combine it with the ſublimate by triture and repeating the operation. If the mercurius dulcis ſhould prove over-doſed with mercury, its ſuperfluous quantity may be eaſily ſeparated by diſtillation: break the cake into ſmall pieces, and put them in a low retort, with its neck a little reclined; then gradually increaſe the fire, till no more mercury drops into the receiver.

ſublime it ſix times, or more, it is called calomelas[k].

ITS operation is cathartick: it is given to kill worms, and in all venereal caſes, even to the raiſing of a ſalivation. It's doſe is from five grains to one dram.

WHEN you grind the ſublimate and crude mercury together, muffle yourſelf with a napkin or handkerchief, to keep the volatile atoms which will riſe from the ſublimate out of your mouth and noſtrils; and be careful not to make the fire too big, for too fierce a fire makes it riſe black; and if ſo, you muſt ſublime it again; and if that ſublimation does not bring it to its colour, mix with every pound of mercurius dulcis, one ounce and a half of decrepitated ſalt, and ſublime it again.

Red precipitate of Mercury.

TAKE crude mercury, one pound, of aqua fortis[l] (made as at the end of this proceſs) two pounds; let them ſtand in the heat of aſhes, that the aqua fortis may ſimmer, till the flowers begin to appear; then increaſe the fire till the flowers riſe red about the middle of the glaſs, and proceed with the fire to the higheſt degree, for the ſpace of three hours; after which, let all cool, and take out the precipitate.

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[k] Calomel is an improper name of this preparation, as it ſignifies another of a different kind, whoſe colour is black.

[l] The aqua fortis for this preparation ſhould be drawn over from a little common ſalt. This gives the precipitate a bright ſparkling appearance. A pound of mercury will gain ſomewhat better than two ounces in this preparation.

It is rarely given inwardly, without correction: It eats proud fleſh, and is uſed for the laying open of ſhankers. Some chirurgeons have in the army uſed it internally with ſucceſs: and I have heard gentlemen of probity aſſert, that they knew an old quacking nurſe give a full dram to very robuſt fellows, in venereal caſes, and they have eſcaped.

The aqua fortis which you ſave in making of ſublimate, is beſt for this operation, which alſo ought to be performed in a chimney. If you take double the quantity of this ſublimated ſpirit, the mercury will ſooner diſſolve.

The prince's powder.

Take of red precipitate (made as before) half a pound; grind it very well upon a marble or porphyry-ſtone; put it into a cucurbit, with two quarts of water; place it in a ſand-furnace, and give it fire to make it ſcalding hot: let it ſtand ſo twelve hours, ſtirring it once in two hours; then let it cool, and decant the water. Put this precipitate into water a ſecond and a third time, repeating the operation as before: then dry the precipitate, and grind it with double the weight of the ſalt, extracted from the reſidence of the tinctura metallorum [m]. Put them into a cucurbit with water, proceeding in all things as above, till the precipitate

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[m] Any fixed alkaline ſalt will do as well.

remains inſipid: then dry it, and boil it in ſpirit of wine. Decant the ſpirit, when cool, and dry the precipitate.

IT is emetick and cathartic, and is given in moſt venereal and chronic caſes. The doſe, from three grains to half a ſcruple.

Mercury precipitated with flowers of antimony.

TAKE of mercury (which has been diſtilled with ſalt of tartar and quick-lime) four ounces; grind it with as much flowers of antimony as will ſaturate it; put it into a bolt-head, or an infernal glaſs, which place in a ſand-heat. Continue it ſo, till it is converted into red flowers; which are much more cathartic than emetic, and are given in venereal, and other chronic diſeaſes. The doſe from three to eight grains.

An excellent precipitate of Mercury.

DISSOLVE four ounces of ſal enixum in one pound of ſpirit of nitre: in this menſtruum, diſſolve four ounces of mercury; put it into a retort, which place in a ſand-heat; give it a gradual fire, till it ceaſeth dropping: when cool, take the retort out of the ſand; in its bottom you will find a maſs of a pleaſant golden colour. Reduce this into a fine powder, and put it into a freſh retort; then cohobate the drawn ſpirit, with four ounces of new ſpirit of nitre, and diſtil as before. Repeat it a third time; take out the precipitate, and waſh it.

I have known this medicine uſed with wonderful ſucceſs. The doſe, from two to eight grains.

The Red Panacæa of Mercury.

TAKE what quantity you pleaſe of red precipitate; put it into a cucurbit; and afterwards, eight times its weight of ſpring-water: let it ſtand in a heat of ſand twenty-four hours, ſhaking it three or four times; pour off the water, and keep it for uſe. Then dry the precipitate, and put to it eight times its weight of ſpirit of wine: fit a glaſs to the mouth of the cucurbit; lute it well, and ſet it in a gentle heat. Let it continue there fifteen days: ſhake it often; and after it is cool, pour off the ſpirit of wine by decantation. Then take the precipitate, and put it in a china-diſh, with twice its weight of tincture of ſulphur. Set it on fire, and burn off the tincture; and then put on freſh ſpirit of wine. Let it ſtand in a very gentle heat two or three hours; and after it is ſettled, decant. Dry the precipitate, and put it up for uſe.

It is one of the beſt mercurial precipitates, eſpecially in the venereal pox. Its operation is cathartic, and ſometimes a little emetic. Its doſe is from two to twelve, or fifteen grains.

The red precipitate muſt alſo be ground very fine before it is waſhed, for the reaſon aforeſaid. Mr. *Barton*, an eminent ſurgeon of *London*, kept this as a ſecret.

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The White Panacæa of Mercury.

GRIND calomel to very fine powder, and put it into a cucurbit, with eight times its weight of ſpirit of wine: place it in warm ſand; let it ſtand fifteen or twenty days, and ſhake it every day two or three times; then fit a glaſs to the mouth of the cucurbit, and make it a circulating glaſs. Separate the ſpirit, either by decantation, or diſtillation, and dry the powder in a gentle heat. This is called panacæa mercurii.

ITS doſe is the ſame with mercurius dulcis; and ſome think it a better and more ſafe medicine, becauſe the ſpirit of wine takes from it ſome of its corroſive ſalts, or at leaſt corrects them.

BEFORE you put the ſpirit of wine to it, you muſt reduce it into a moſt impalpable powder, which muſt be paſſed through the fineſt ſieve, that ſo the ſpirit of wine may the better act upon thoſe minute atoms, and waſh off part of the corroſive ſalt, which keeps it in a dry form.

White Precipitate.

DISSOLVE four ounces of mercury in eight ounces of ſpirit of nitre: when it is all diſſolved, put it into a wide-mouthed glaſs, in which is a pint of ſpring-water; ſhake them together, and pour on filtered brine, by little and little: let the brine be as ſtrong as you can make it; to a pint of which, put in two ounces of ſpirit of ſal armoniac;

ſtir the matter about, and let it ſettle; then put on more brine: ſtir, and let them ſtand to ſettle as before; and ſo continue putting on brine, till you perceive no more will precipitate. Then let it ſtand five or ſix hours to ſettle, and pour off the water by inclination. Put on common water, ſtir it about; and, when ſettled decant as before; and ſo proceed, putting on freſh water, ſtirring and pouring off, till you find the precipitate inſipid [n]. Then lay a clean paper upon a chalk-ſtone; put the precipitate upon it, and let it lie there, till the chalk has abſorbed the water: then remove it to a board, and let it dry in the ſhade, between two papers.

ITS operation is a little cathartic, and emetic ſometimes; it alſo procures ſalivation. It is given in the French pox, ſcurvy, and yellow-jaundice. Its doſe is from five to fifteen, or twenty grains. If you boil it two or three hours in ſpirit of wine, it will free it from ſome of its corroſive ſalts, and render the medicine more ſafe.

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[n] The ablution with common water ſhould not be too often repeated, or the water ſuffered to ſtand too long upon the precipitate, for it will at length entirely diſſolve the whole. If a fixt alkaline ſalt be added to the water which has ſerved to waſh this preparation, a new precipitate will be obtained.

Some of the chemiſts have been accuſtomed to make this in a more ſkilful and advantageous manner, by diſſolving equal quantities of ſal armoniac and corroſive ſublimate mercury in water, and then precipitating them with a fixt alkaline ſalt. This precipitate is to be waſhed with repeated affuſions of water in the ſame manner as the above.

PUT not above two ounces of the ſpirit of nitre at a time upon the crude mercury; and when it has acted upon the mercury, and the fumes begin to ceaſe, put on two ounces more; and ſo do, till the mercury is all diſſolved. If you ſhould put all the ſpirit of nitre on at once, the action would be ſo violent, that it would heat too ſuddenly, and endanger the glaſs. Be as cautious as you can; the fumes will riſe with ſome violence, and therefore this operation ought always to be done in a chimney, that the ill fumes may be avoided °.

Turbith mineral, or yellow Precipitate.

TAKE four ounces of quick-ſilver; put it into a retort, and to it four ounces of ſpirit of nitre: let it ſtand till it has done fuming; then add oil of vitriol, half a pound: place the retort in a ſand-furnace, give it a gradual fire to the fourth degree, and the operation will be performed in ſix or ſeven hours time. Then take out the retort, and break it: pulverize the white maſs, either in a glaſs, or marble mortar; put it into a wide-mouthed glaſs, and pour to it three pints of warm water: let it ſtand two hours, and ſhake it three or four times; when it is ſettled, pour off the water by inclination, and keep it by itſelf. Put more water to the yellow powder; ſtir it well about, and when ſettled,

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° If the mercury be added to the ſpirit of nitre by little and little, the ſolution will go on calmly, and the diſſipation of the noxious vapours be entirely prevented.

ſettled, pour off, as before; and ſo proceed with ſeveral ablutions, till the powder has no taſte; dry the powder upon a gentle heat of ſand, and put it up for uſe.

The firſt waſhings [p] are good to touch old and ſtubborn ulcers with, and to mix with any ſweet water to cure the itch. The turbith is cathartic and emetic, and is chiefly uſed in venereal caſes. The doſe is from two to eight grains.

The oil of vitriol does not diſſolve the mercury, it only calcines it; but the ſpirit of nitre diſſolves it, and produces a turbith more ſubtile than that made with oil of vitriol alone [q].

Green

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[p] The firſt waſhings carry off ſuch parts of the menſtruum as are not combined with the mercury, and diſſolve a conſiderable quantity of ſuch as are, and ſo defraud the operator of the due quantity of calx. This is evident from the quantity of precipitate which may be gained from theſe liquors by the addition of a fixt alkali, and from the calx proving lighter, inſtead of heavier than the mercury. Four ounces of mercury corroded by oil of vitriol, weighs five ounces and a half. This calx being well waſhed, is reduced to three ounces and one quarter.

[q] Turbith mineral is uſually prepared without ſpirit of nitre, which indeed is of no further uſe in this preparation, than to facilitate the action of the vitriolic acid upon the mercury. This proceſs is not to be performed without ſome difficulty and danger; but by obſerving the following cautions, both may be avoided. Take two parts of ſtrong oil of vitriol, and one of pure mercury; put them into a low retort, which muſt not be filled above half full. Place the retort in a ſand furnace, under a good chimney, ſo that the aſcending drops may not fall back into it, but may be conveyed immediately into the receiver.

Green Precipitate [r].

PUT four ounces of mercury into a matraſs, to which put of ſpirit of nitre, or double aqua fortis, eight ounces. In another glaſs put half an ounce of fine copper, which diſſolve in an ounce and a half of ſpirit of nitre, or aqua fortis. Put both the diſſolutions together, place them in ſand, and abſtract the aqua fortis. In the bottom of the veſſel there will remain a blackiſh maſs, which muſt be powdered in a glaſs or marble mortar. This done, put it into a cucurbit, and pour upon it four pints of diſtilled vinegar; ſet it in a heat of ſand, where let it continue forty-eight hours, ſhaking it once in two or three hours: at laſt, augment the fire to make the diſtilled vinegar boil; let it continue ſo at leaſt one hour, and when cold, pour off the

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receiver. Cover the body of the retort quite up to the neck, with ſand: apply a gradual fire till the oil of vitriol begins to boil: keep it in this degree, till the ebullition ceaſes; then increaſe the fire to the utmoſt the furnace is capable of giving. When the receiver grows cold, let the fire go out; and edulcorate the maſs remaining at the bottom of the retort, as above directed.

[r] In the laſt edition of the *Edinburgh* Pharmacopæia, there is an elegant compoſition of this kind directed in a very ſcientifical manner, which for its ſingularity, I ſhall here inſert. "Take of corroſive mercury ſublimate in powder four ounces. Diſſolve this in a quart of hot water. Take of filings of copper an ounce and a half, ſpirit of ſal armoniac eight ounces; digeſt in a matraſs till you have got a deep blue tincture: filter this, and drop it by little and little into the mercurial ſolution; when the precipitate has fallen, evaporate to dryneſs."

the diſtilled vinegar by inclination, and you will find it tinged of a green colour; put upon that which remains, more diſtilled vinegar, and proceed as before: filter the tinged vinegar, and put it into a cucurbit; ſet it in a heat of ſand to evaporate gently, to the conſiſtence of honey, or that it begins to ſparkle; then take it from the fire, and let it cool; when 'tis cold, it will be an hard maſs, which make into fine powder, and keep for uſe.

ITS operation is cathartic and emetic. It is a ſpecific in gonorrhœa's, and is given in all venereal caſes. The doſe is from two to ſix grains.

YOU ought to obſerve the ſame precaution here as in the white precipitate, *viz.* to put the ſpirit of nitre upon the mercury by little and little; and alſo to perform the operation in a chimney.

Æthiops Mineral.

TAKE flowers of ſulphur, and crude clean mercury, of each half a pound; let them be ground together in a clean iron mortar, till they are incorporated into a black powder. It will take up four or five hours time to grind it [s].

The

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[s] This preparation is made much ſooner, and with greater eaſe, by melting the ſulphur in an iron ladle over the fire, and then putting in the mercury. (ſee page 77) There are many perſons who condemn this practice, and particularly order the æthiops to be made without fire; and as this circumſtance has been frequently, though I think, without any good reaſon, inſiſted on; I ſhall endeavour to ſet this affair in a true light, by ob-

The Coralline ſecret of Mercury.

TAKE four ounces of red precipitate, put it into a retort, and put to it eight ounces of ſpirit of nitre; ſet it in a ſand-furnace, and draw off the ſpirit in a gradual heat, to the fourth degree. This operation will be performed in five or ſix hours; return that ſpirit of nitre, with four ounces of new ſpirit upon the precipitate, and draw off as before: repeat the ſame operation, with four ounces of new ſpirit; and at laſt let it continue at leaſt two hours, in the fourth degree of fire: then let all cool, and you will have a very red and ſubtile powder; which put into a crucible, and ſet in a fire of charcoal, but not exceeding a worm-red, half a quarter of an hour. Then put it into a matraſs, and add to it three pints of diſtilled fountain or rain-water; ſet it in a ſand-furnace, and give it a gradual fire till it boils; and ſo keep it half an hour: pour off that water by inclination, and dry the powder gently; then put to it twelve ounces of tartarized ſpirit of wine, and in a gentle heat draw it

obſerving, that the ſulphur and mercury have undergone much greater degrees of fire in their extractions from their matrices, (particularly the mercury) than is here required; that the union of the mercury with the ſulphur is more effectually completed by this means than by the degree of triture, which the apothecaries are accuſtomed to; that the fire is not ſuppoſed to communicate any ill qualities to the ſulphur and mercury in cinnabar, though an intenſe heat is neceſſary to ſublime it. See Pharmacopæia Reformata, p. 82.

it off, and ſo proceed by two cohobations: then put to it twelve ounces of new tartarized ſpirit of wine, fit a glaſs to the mouth of the cucurbit, to make it a circulatory veſſel; let it ſtand in a gentle heat of ſand forty-eight hours; and at the laſt of all, let it ſimmer a little; then let all cool: decant the ſpirit of wine, and dry the powder, which is called arcanum corallinum.

Its operation is chiefly cathartic. It is given in the gout, dropſy, ſcurvy, and the pox; and is one of the beſt precipitates commonly made. Its doſe is from three to ten grains.

You may take clean crude mercury, inſtead of red precipitate, if you pleaſe; the firſt diſſolution and exſiccation makes it red precipitate: then you may freely put all the ſpirit of nitre upon the precipitate at once; becauſe the action of the mercury and ſpirit of nitre is over in the firſt diſſolution of the mercury. In all things elſe proceed as the proceſs directs.

Oil of Mercury.

EVAPORATE the firſt waſhings of mineral turbith to a ſalt, ſet it in a cold moiſt place, and it will diſſolve into a ſtrong corroſive liquor, which is called oil of mercury.

It is of excellent uſe to touch venereal ſhankers, if you apply to them pledgets dipt therein.

Another Oil of Mercury.

TAKE four ounces of corroſive ſublimate, and of ſublimated ſal armoniac half a pound; make them both into fine powder, and mix them well; put them into a retort, place it in ſand, with a receiver to it; make a fire, which raiſe gradually to the fourth degree, and in ſeven or eight hours time the operation will be done. Take all that is diſtilled and ſublimed, grind it in a glaſs or marble mortar, and afterwards ſet it in a cellar, in a flat glaſs, to diſſolve into a liquor, which is called oil of mercury.

IT is endued with the ſame virtues the preceeding oil is.

THESE oils are mercury coagulated by the corroſive ſpirits of vitriol, common ſalt, and ſal armoniac; which afterwards will diſſolve again like a ſalt: it ought to be evaporated in glaſs, becauſe earthen veſſels will ſuck in too much of the ſalt, and it will prey upon the lead with which the veſſel is glazed.

CHAP. VIII.

Of Biſmuth, or Tin-Glaſs.

IT is a ſmooth, white, metallic matter, brittle, and breaks in large flakes, like regulus martis. It is artificial, and compoſed of tin, tartar, and arſenic; not made in any quantity in *England*, but in the northern parts of *Germany*, from whence we have it[t].

Preparations of Biſmuth.

Flowers of Biſmuth.

BEAT four ounces of biſmuth into fine powder: mix this very well with half a pound of nitre likewiſe in fine powder. Set an earthen body, with a perforation in its ſide, " in a ſubliming furnace, and adapt to it a ſet of aludels; put a glaſs head

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[t] Biſmuth, wiſmuth, ſilver marcaſite, or tin-glaſs, is not an artificial compoſition, as has been erroneouſly ſuppoſed by many writers, but is the product of an ore, which is ſometimes found ſo rich, as to yield, upon being barely expoſed to a ſmall heat, a conſiderable quantity of this ſemi-metallic ſubſtance. The ſpecific gravity of biſmuth is to that of gold as 9,700 to 19,640; but it comes neareſt in weight to copper, to which it is as 9,700 to 9,000. It eaſily melts, and, added to other metals, greatly promotes their fuſibility; hence it is frequently made uſe of in ſolders. Fire ſoon diſſipates it in the form of ſmoke. Melted with lead, tin, or ſilver, and afterwards amalgamated with mercury, it attenuates them ſo as to paſs through leather; but ſeparates from this amalgama in a few days. It diſſolves with great efferveſcence in the nitrous acid, and likewiſe in aqua regia: it alſo diſſolves in ſpirit of ſalt, but ſlowly: the vitriolic acid has little or no effect upon its reguline parts: vinegar and the vegetable acids eaſily diſſolve it, and acquire a ſharp, bitter, braſſy taſte. Mixt with ſulphur, it readily flows into a ſtriated ſubſtance reſembling antimony, but eaſily parts with it in the fire. Melted with tin, it makes it harder and brighter. Fluxed with zinc, it is ſaid (ſee *Cramer. Elem. Art. docimaſt. ed.* 2. *vol.* 1. *p.* 69.) not to mix with it, but to ſeparate diſtinct, although they are throughly ſtirred together.

head and recipient on the uppermoſt, and as ſoon as the bottom of the body is red hot, project the mixture into it, through the hole," by half a ſpoonful at a time. When the operation is over, take away the aludels, and wipe off the flowers with a feather. Theſe flowers are very white, and eſteemed an excellent fucus.

LET all be ſublimed, which will riſe from one half ſpoonful, before you put in another, which you may know by the ceaſing of the little crackling: waſh the ſalt from that which remains in the bottom of the ſubliming pot, and it is not only a good fucus, but alſo a good diaphoretic, eſpecially if the ſpirit of nitre be once or twice diſtilled from it after its waſhing.

ITS doſe and virtue is the ſame with mineral bezoar.

Magiſtery of Biſmuth.

PUT one pound of ſpirit of nitre (made with oil of vitriol) into a quart body uncut, and add to it as much powder of tin-glaſs, by an ounce at a time, as the ſpirit is capable of diſſolving, which will be about ſeven or eight ounces: then take two gallons of water, and diſſolve in it four ounces of common ſalt; filter the whole, and put it into a clean earthen pan; pour upon it the ſolution of biſmuth, and immediately it will turn milky, and a precipitate will fall: permit it to ſtand, till ſettled, and, by gentle inclination, pour off the water from the magiſtery. Put on more freſh water; ſtir it well, and when ſettled, pour it off: and ſo continue the ablutions, till the magiſtery is inſipid, which dry gently, and keep for uſe, which is the ſame with the flowers[u].

Be ſure to place the cucurbit in the chimney, the better to convey the fumes, which are bad for the breaſt, lungs, and brain: and if you ſee a black ſcum upon the ſurface of the water when you make the precipitation, take it off with a ſpoon.

"CHAP. IX.

Of Zinc.

ZINC, tutenag, or ſpelter, is a ſemi-metallic ſubſtance, ſomewhat reſembling lead as to its external appearance. It is obtained from a peculiar

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[u] Few of the trading chemiſts are acquainted with the method of preparing this magiſtery, with its due requiſites of brightneſs, colour, and lightneſs. For the purpoſes this preparation is generally deſigned, the proceſs above will not make it ſufficiently pure: I ſhall therefore communicate another.—— Take any quantity of proof aqua fortis; put it in a parting glaſs, or ſmall bolt head, and ſet it under a chimney: into this, ſlowly and by degrees, let fall a little quantity of biſmuth groſly powdered, waiting till the firſt is diſſolved, before a ſecond parcel is added. When the menſtruum will no longer act upon the metal, warily decant it, and pour it into a conſiderable quantity of pure diſtilled water; it will grow turbid, and ſoon depoſite an extremely white precipitate: if ſpirit of wine be added to the water, the precipitation will be ſooner completed. Decant the water from the magiſtery, which carefully dry in the ſhade, between two papers: the light of the ſun, or fire, will change its colour.

ſort of lead ore, at *Goſlar* in *Germany*, by a particular kind of ſublimation [w]: it is likewiſe brought from the *Eaſt-Indies.* It melts in a gentle fire, ſoon after it ſmokes, and then ſticks to the ſides of the veſſel in the form of light, white flowers, like wool: in a greater fire it burns with a green flame. It mixes eaſily with lead and tin, and renders them leſs malleable: it makes copper leſs ductile, and at the ſame time gives it a golden colour. It readily diſſolves in vinegar, and likewiſe in the vitriolic acid diluted with water: it is alſo ſoluble in the nitrous and marine acid. It difficultly mixes with ſulphur in fuſion, but at laſt is changed by it into a brittle, dark-coloured, ſhining ſubſtance. Ground with mercury, it mingles with it, but is thrown out, in the form of a calx, by continuing the triture, and adding water. The pewterers add it with their tin, and the braſiers make their (ſpelter) ſolder of a mixture of it and copper.

Prince's Metal.

TAKE four ounces of copper in filings, or clippings of thin plates; heat them in a crucible with a quick fire, till they are juſt upon the point of melting: then add an ounce of zinc previouſly melted in an iron ladle; ſtir the whole together with a very hot iron rod, and as ſoon as it is melted, pour it out into moulds."

CHAP.

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[w] See *Stahl* diſſert. metallurg. pyrotechn.

CHAP. X.

Of ANTIMONY.

ANTIMONY is a mineral body, nearly related to metals, but more approaching to the nature of ſaturn : it is compoſed of a mineral ſulphur, partly pure, and of a ſolar nature ; and partly combuſtible, like other ſulphurs.

IT is full of an indigeſted fuliginous mercury, but more fixed than the common. It is a moſt excellent ſubject both for internal and external medicine, *&c.* [x]

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[x] Antimony is a ponderous mineral ſubſtance, conſiſting of long ſhining ſtreaks, or needles : it is compoſed, according to *Stahl,* of two or three parts of ſulphur, not at all different from the common ſort, and one of a white, brittle, ſemi-metallic ſubſtance. It eaſily melts in the fire ; and in a great heat proves totally volatile. Calcined with a gradual heat, it at length melts into a reddiſh glaſs. It promotes the fuſion of all the metals, and volatizes them, gold alone excepted. The crude mineral melted with iron, copper, lead, tin, or ſilver, depoſites its metallic part in the form of a regulus, while its ſulphureous converts them into ſcoriæ, which ſwim upon the top. Fuſed with fixed alkaline ſalts, its ſulphur is ſeparated, and rendered ſoluble in water : at length its reguline parts are taken up. Its glaſs diſſolves ſtones of all kinds ; and, in a ſtrong fire, carries them away with it. Its regulus makes tin harder, whiter, and more ſonorous ; hence its uſe in pewter and bell-metal : it likewiſe promotes the fuſion of iron, and makes it flow extremely thin ; at the ſame time, it renders it very hard, and deſtroys its malleability : it is ſoluble in the vitriolic acid ; corroded by the nitrous ; perfectly diſſolved by aqua regia, and the

Regulus of Antimony.

TAKE of antimony, one pound; tartar, twelve ounces; nitre, ſix ounces[y]; powder them finely, and mix them exactly; ſet a crucible in a melting furnace: let the fire increaſe gradually, till the crucible is red hot; then put in the mixture, by a ſmall ſpoonful at a time; when it is all in, increaſe the fire, and ſtop the door of the wind-furnace; and let the matter continue in fuſion half, or three quarters of an hour[z], till its ſparkling in the crucible is well ſpent: then pour it into a little mortar, being firſt made clean, and afterwards heated, and greaſed with a little butter, tallow, or wax[a]. Let it ſtand, till cold, and then turn

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the concentrated ſpirit of common ſalt; but is not acted upon by vinegar, or the vegetable acids: it is by no means miſcible with mercury. Fuſed along with ſulphur, it reſumes its priſtine form and qualities.

[y] The quantity of the ſalts is conſiderably too large for the antimony: one half of them is more than ſufficient. It is better to put them into a pan, and deflagrate them with a red hot iron, before they are mixed with the antimony; for, by this means, a conſiderable loſs is prevented, which happens from the violent detonation when they are projected together.

[z] Five minutes, if your furnace be good, are enough: a fire ſo long continued as here directed, muſt needs diſſipate a conſiderable part of this volatile mineral, at the ſame time that the ſcoriæ are enabled to take up afreſh a good deal of the regulus.

[a] Take great care, that whatever you greaſe the veſſel with, into which you are to pour the melted matters, be free from all moiſture;

turn it out: beat off the ſcoriæ, and put them by in an earthen pan, to make the ſulphur auratum with; then melt your regulus again, and project one ounce of nitre in powder. Let the mixture ſtand in fuſion a quarter of an hour; and caſt it out into the mortar, heated, then greaſed as before, and it will be more pure. If you would have it yet more pure, repeat the laſt operation once more, ſtill ſaving the ſcoriæ together. This regulus you may form into cups, pills, or infuſe it in white-wine ten or twelve hours, which will have the ſame operation with the infuſion of crocus metallorum.

DIFFERENT quantities are uſed in the making this regulus: ſome take equal parts of antimony, nitre, and tartar; others, antimony, one pound; tartar, one pound and a half; and nitre, two pounds: but I have found no compoſition produce more, or better regulus, than this I have given you.

THE melting furnace muſt be placed in a chimney, and have a care you do not bring any ſpark of fire along with the ſpoon you project the mixture with; if you do, it will ſet all the compoſition on fire.

Another

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moiſture; otherwiſe, from the ſudden rarefaction of it, great part will be thrown out with violence and conſiderable danger. It is more convenient to black the inſide of it with the ſmoke of a torch.

"*Another proceſs for obtaining the Regulus of Antimony.*

TAKE of crude antimony, one pound: break it into a very coarſe powder; mingle this with one fourth of its weight of charcoal-duſt; ſpread the mixture over the bottom of a flat earthen pan; apply a gradual fire to it, ſo as not to make the pan at leaſt red hot; keep continually moving it with a little iron rake, carefully avoiding the fumes, till it ſmokes but very little: mix this with a quarter of its weight of the black flux [b], and melt it in a crucible with a quick fire: as ſoon as it is in perfect fuſion, pour it out into a heated cone, the inſide of which you have already greaſed, or ſmoked; the regulus will ſubſide to the bottom, in a much larger quantity than can be gained by the foregoing proceſs."

The Golden Sulphur of Antimony.

BOIL the ſcoriæ of the regulus in twenty times its weight of fountain water, the ſpace of one hour; ſtir it often, and, whilſt hot, run it through a fine ſtraining-cloth; then put diſtilled vinegar [c] to it, and there will precipitate a red powder: let it ſtand to ſettle, and drop more diſtilled vinegar into it; and if it turns the clear liquor muddy, let it ſettle, and drop yet more diſtilled vinegar again into it; and ſo proceed, till you ſee the liquor will not turn muddy, by putting diſtilled vinegar to it: waſh it with many warm waters, till it is without taſte or ſmell; then put it into a coffin of paper, to drain off as much of the water as you can; and laſtly, put it into a flat earthen diſh, and ſet it in a gentle warmth to dry.

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[b] Grind two parts of crude tartar and one of nitre, in a mortar; then apply a red hot iron to the mixture, which will take fire, and be converted into a black coal; powder this while hot, and keep it in a veſſel cloſe ſtopt for uſe.

[c] Spirit of ſalt is a cheaper acid, and therefore commonly employed for this purpoſe.

It is emetic and cathartic, and endued with the ſame virtues other antimonial emetics are. Its doſe is from one to ſix or eight grains.

If you do not paſs the liquor through the ſtrainer while it is hot, it will coagulate when it has paſſed the filter: and when you precipitate the ſulphur[d], remove it into ſome place wherein the ſtench may not offend you. You muſt waſh it very often with warm water, to diſſolve the ſalts which adhere very ſtrictly to it.

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[d] This preparation is not ſtrictly a ſulphur, but is compoſed of a conſiderable part of the regulus of antimony, as well as of its ſulphur, as will appear evidently from the following trial. Mix four parts of the preparation with two of bright filings of iron, and one of the black flux: melt this with a quick fire in a crucible; pour it out into a cone, and a conſiderable deal of regulus will be found at the bottom. If this preparation be only wanted, it may be made at a much cheaper rate by fluxing any quantity of antimony with equal its weight of pot-aſh, or other fixt ſalt: by this proceſs almoſt all the antimony will be ſoluble in water, and may then be treated as the above ſolution.

" *Kermes Mineral.*

TAKE a pound of antimony, four ounces of any fixt alkaline ſalt, and a pint of water. Boil them two hours; then filtrate the warm liquor, and the kermes will precipitate as it grows cool. Pour off the liquor, and add to it three ounces of fixt alkaline ſalt and a pint of water: boil the antimony in this lixivium as before; repeat this a third time, with the addition of two ounces of fixt alkaline ſalt, and one pint of water, and filtrate as before. This preparation differs not from the ſulphur auratum deſcribed in the foregoing proceſs."

The Martial Regulus of Antimony.

TAKE of ſmall nails, one pound and a half[e]; put them into a large crucible, placed upon a tile in a melting furnace: let the fire kindle about them gradually, till the nails are ready to melt; then project (by a good ſpoonful at a time) of antimony, one pound; nitre, four ounces; and two ounces of tartar[f], powdered and well mixed: bury the crucible in charcoal, ſhut the door of the furnace,

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[e] Half a pound of nails is enough to abſorb the ſulphur of the antimony.

[f] Five or ſix ounces of the black flux is better, for the reaſons alledged in the remark on the regulus of antimony; or four ounces of any fixed alkaline ſalt may be added, inſtead of either of them.

nace, and let it ſtand in the ſtrongeſt fuſion, till it has done ſparkling: then take it from the fire, and pour it into an iron mortar, hot, and greaſed as uſual: when it is cold, beat off the ſcoriæ, and melt it again; and put to it (by a ſpoonful at a time) two or three ounces of nitre in groſs powder[g]: let it ſtand in ſtrong fuſion, as before, till it ceaſes to ſparkle; then remove it from the fire, and pour it into a warm mortar as before. Repeat the ſame operation the third and fourth time, always caſting in two ounces of nitre; but the fourth time, let the regulus melt well, before you put in the ſalt-petre. When cold, beat off the ſcoriæ, and you will ſee a perfect ſtar upon the ſurface of the regulus.

Its operation is as the regulus antimonii, but more cathartic: ſome ſay it is altogether cathartic, but I have not found it ſo. It is given in the venereal diſeaſe, dropſy, and ſcurvy. Its doſe is from two to eight grains.

Nails are better than filings of iron, becauſe they lie more hollow, giving way for the antimony to mix and melt more eaſily with the mars.

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[g] Sometimes the regulus retains part of the iron, which gives it a duſky hue: it is therefore convenient to add, upon the ſecond fuſion, about a quarter part the weight of the regulus of crude antimony; and when the whole is in perfect fuſion, to project, at times, a ſixth part of dry and very hot fixed alkaline ſalt; and as ſoon as it is well melted, to pour out the whole. This regulus may be ſtill further purified by a third fuſion, with the addition of a little nitre. When certain circumſtances are obſerved, the top of the regulus will be marked with the figure of a ſtar. See a particular account of this in *Stahl, opuſcul. chymico-phyſico-medic.* p. 481.

Regulus Jovis, or Regulus of Antimony with Tin.

TAKE good regulus of antimony, four ounces; melt it in a crucible, with four ounces of tin, a quarter of an hour; in which time put in one ounce of nitre; and when the flame is ſpent, and the matter well fluxed, take it from the fire, and caſt it into a warm greaſed mortar.

In the ſame manner you may make the regulus of gold, ſilver, copper, or lead.

It is uſually given in the ſuffocation of the womb, and to open all obſtructions. Its doſe is from three grains to a ſcruple.

If you give this regulus two or three fuſions more, and in each fuſion caſt one ounce and a half of nitre into it, and do ſo as long as the nitre meets with any ſulphur to cauſe a flame; the regulus will be as white as ſilver [h].

Crocus Metallorum.

TAKE of antimony, one pound; nitre, fourteen ounces; and common ſalt, two ounces; powder them finely, and mix them well; ſet a crucible in the fire; when it is red hot, put in the mixture by a ſpoonful at once; when all is in, ſhut the door of the furnace. Let the matter ſtand in a ſtrong fuſion half an hour; then take it from the fire, and caſt it into a warm greaſed mortar [i].

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[h] Every freſh injection of nitre converts ſome part of the compoſition into a ſcoria; and if you continue to add nitre till ſuch time as it no longer deflagrates, the whole maſs will be entirely converted into a calx. One ſingle fuſion, with an ounce or two of fixed alkaline ſalt, will make this regulus ſufficiently pure and bright.

Its operation is emetic; but the infuſion of it, in white-wine or canary, is generally uſed thus, *viz.* one ounce of the crocus in fine powder, to a quart of wine; which is given from half an ounce to four ounces. Its doſe is from two to eight grains.

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[i] The trading chemiſts are accuſtomed to make this preparation with much leſs trouble, and leſs nitre, than here ordered. About eighty pounds of antimony are mixed with fifty pounds of well dried nitre, and two or three pounds of common ſalt. This mixture is put by degrees, with an iron ladle, into an iron pot or mortar, ſomewhat heated, and placed under a good chimney. After the firſt ladle-full is put in, a piece of lighted charcoal is thrown to it, which ſets it on fire, and then the reſt is projected: the deflagration will be ſoon over, and the whole mixture in perfect fuſion. When it is cold, a conſiderable quantity of ſcoriæ will appear upon the ſurface, which may be eaſily ſeparated from the crocus by a hammer. This preparation, made according to the above proceſs, appears redder than that which is made with a large portion of nitre. Eighty-ſix pounds of antimony, fifty-one pounds of unrefined nitre, and two pounds of common ſalt, both well dryed, yielded ſeventy-eight pounds of clean crocus metallorum of an excellent colour, ſeven pound which was ſomewhat mixed with ſcoriæ, and thirty-two pound of white ſcoriæ. Mr. *Lemery* obtained from eight ounces of antimony, and an equal quantity of ſalt-petre deflagrated in a mortar as above, eight ounces and a quarter of crocus. This extraordinary yield was owing to part of the ſcoriæ being retained in the crocus, for want of a proper fuſion of the mixture, which muſt neceſſarily happen when the quantity is ſo ſmall.

I leſſen the uſual quantity of nitre, and in its place ſubſtitute common ſalt, which both helps fuſion, and cauſes a better ſeparation of the crocus from the ſcoriæ.

Diaphoretic Antimony.

TAKE of antimony, one pound; of ſalt-petre, three pounds; powder, and mix them exactly: then put them into a red hot crucible [k], by a ſpoonful at a time, and let it ſtand half an hour. Remove it before it is quite cold, and put it into a large earthen pan, almoſt full, either of hot or cold water: let it remain there ten or twelve hours, to diſſolve the ſalt; then take it out, and if any of the calcined antimony adheres to the crucible, ſcrape it off with a knife: ſtir the white matter about with a clean ſtick; and when it is ſettled, decant the water into a clean pan, and keep it to make the antimonial ſal prunellæ. Put on more warm water, and decant it as uſeleſs; repeat the ablution till the antimony is inſipid. When this is done, put more freſh water; ſtir it about, and preſently pour it off into another pan: put on more, and pour off as before; and ſo do, till all the fineſt part of the preparation is waſhed off: and by this means, you may ſeparate it from the groſs dirty part. Having thus ſeparated the finer part, let it ſtand to ſettle, and pour off the water by inclination: put the antimonium diaphoreticum upon a clean ſheet of whited-brown paper, and lay it upon a chalk-ſtone, to ſuck in the moiſture: remove it into a very gentle heat to be perfectly dried, and then put it up for uſe.

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[k] If this preparation is to be made in large quantities, it may be deflagrated in a veſſel, in the ſame manner as the crocus metallorum is done. Six pounds of antimony mixed with eighteen pounds of dry nitre, yielded ſix pounds ten ounces of antimonium diaphoreticum.

Its operation is diaphoretic: it is given in venereal diſeaſes, dropſies, ſcurvies, malignant fevers, and the ſmall-pox. Its uſual doſe is from five grains to twenty-five, but I have known it given with good ſucceſs, by half an ounce at a doſe, and repeated at two or three times in a day, and that for ſeveral days ſucceſſively.

The firſt waſhing which you put by, may be evaporated, and you will have the antimonial ſal prunellæ, which is endued with the ſame virtues as ſal polychreſtum.

You muſt in this, as in moſt calcinations of antimony with nitre, be careful not to bring a ſpark of fire from the furnace to the mixture; and after calcination, beware you put not the crucible into water, when it is too hot, leſt it fly all about your face.

Tincture of Antimony, with Antimonium Diaphoreticum.

TAKE of antimonium diaphoreticum, one pound; of pure ſalt-petre, three pounds; let them be finely powdered and well mixed; then, by a ſpoonful at a time, put the mixture into a red hot crucible: let it ſtand half an hour in a ſtrong melting heat; then pour it into a warm iron mortar; beat it to powder, and before it attracts the air, return it into a matraſs, and add three pints of tartarized ſpirit of wine. Let it digeſt three days and nights, and you will have a glorious tincture, pleaſant to the taſte, very fragrant, and far excelling all other tinctures of antimony. The doſe from ten to ſixty drops.

Ceruſs of Antimony.

IT is made with the regulus of antimony and nitre, in the ſame proportion and manner as you made the antimonium diaphoreticum. Its uſe and doſe the ſame.

Or thus:

TAKE of regulus of antimony, finely powdered, four ounces; put it into a retort, and add (by an ounce at a time) twelve ounces of ſpirit of nitre; then ſhake it, place it in a ſand furnace, lute on a receiver, and give it a gentle fire, till it begins to drop: then increaſe the fire gradually to the fourth degree; keep it ſo till no drops fall from the noſe of the retort, or fumes fly into the receiver: let it cool, and take out the remainder from the retort; powder and waſh it ſweet as you do the other ceruſs, and dry it.

It is diaphoretic, and is looked upon to equal bezoar mineral in virtue. The doſe from ten to fifty grains.

There is no danger of firing the mixture for the firſt ceruſs, becauſe the combuſtible ſulphur is ſpent in making the regulus. From this, or any other antimonial diaphoretic powder, you may extract tinctures.

Antihecticum Poterii.

It is made of one part of regulus jovis, and three parts of nitre, beaten into fine powder, and mixed; and in all things proceed as you did with ceruſſa antimonii.

It is adminiſtered in the pox, hectic fevers, and conſumptions. Its doſe is from five grains to half a dram. The jupiter gives it a bluiſh colour; and that is all in which it differs from the ceruſſa antimonii.

The Medicinal Antimony.

Take antimony, five ounces; ſalt of tartar, one ounce; common ſalt, four ounces; powder and mix them well, and let them ſtand in the crucible half an hour melted; then turn out the compound into a warm greaſed cone, or let it ſtand in the crucible, till cold: beat off the ſcoria, and powder the purer part which remains in the bottom. Give it ſeveral lotions of warm water, till the ſalts are all waſhed from it; then dry it, and keep it for uſe.

SOME attribute only a diaphoretic quality to it; but it will, in ſome conſtitutions, both vomit and purge. Its doſe is from three to fifteen grains.

LET the ſalts be very dry when they are mixt with the antimony, and after they are ſufficiently melted together, and become cold, make the mixture into a ſubtile powder before you waſh off the ſalts.

The Magiſtery of Antimony.

TAKE four ounces of antimony, in very fine powder; put it into a large matraſs; pour upon it one pound of aqua regis, by four ounces at a time[1]; ſet it upon a ſand heat in a chimney, that the fumes may aſcend without offence: make a ſmall fire, and let it ſtand in a heat of digeſtion ten or twelve hours, ſhaking it once in two or three hours; then let it cool, and put to it a gallon of fountain water, which you muſt pour off before it ſettles. Put to it more water; ſtir it, and pour it to the other before it ſettles. Repeat this operation, till nothing remains in the matraſs but a yellow powder, which is the combuſtible ſulphur of antimony. Let the white powder ſettle, and decant the water, and, by ſeveral ablutions, make the magiſtery inſipid; dry it, and keep it for uſe.

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[1] It is better to put all the menſtruum into the matraſs at firſt, and then to add to it, by little and little, the antimony in coarſe powder: by this means, the ſolution will go on more equally, be more perfect, and much leſs fumes ariſe; there is no occaſion of any heat being applied in this proceſs; if the aqua regis be not very weak, it will take up a conſiderable deal more of antimony than that here directed: therefore the quantity of the mineral can only be proportioned to the ſtrength of the menſtruum; and the addition of the former ſhould be continued till the latter ceaſes ſenſibly to act upon it.

ITS operation is more cathartic than emetic: ſometimes it operates by ſweat. It is uſed in apoplexies, the palſy, and hypochondriacal diſtempers. Its doſe is from five to fifteen grains.

MAKE the diſſolution in a chimney, and in a large veſſel; becauſe the ebullition is ſo violent, that if the veſſel be not large, the matter will boil over.

" *Sulphur of Antimony.*

TAKE equal parts of oil of vitriol and crude antimony; put them in a retort, and diſtill them in a ſand furnace, with a gradual fire: a liquor will come over, which is not very acid; and a ſulphur will ſublime into the neck of the retort, in taſte, ſmell, conſiſtence, and inflammability, like common ſulphur [m]. Waſh the maſs remaining in the

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[m] The ſulphur ſeparated from antimony by aqua regis, and by mercury, in making the cinnabar of antimony, appear both to be perfectly like common ſulphur.

the retort with water; a grey powder will ſubſide, and the water not prove very acid[n]."

Poterius's *Cordial.*

TAKE regulus martis in fine powder, four ounces; of gold diſſolved in aqua regis, one ounce and an half; let the aqua regis be drawn from the gold; then mix it with the regulus. Put to the gold and regulus twelve ounces of nitre; mix all exactly, and put them into a red hot crucible by a ſpoonful at a time: let it ſtand in a melting heat an hour; then let it cool, and proceed as you did in the antihecticum Poterii, or ceruſſa antimonii: I have made it both with gold, and the anodyne ſulphur of mars; and the latter has been approved of as the better medicine.

ITS operation is diaphoretic, and it is ſaid to be a purifier of the blood, a ſtrengthner of the heart and ſtomach, good againſt malignant fevers, the ſmall-pox, and the plague. Its doſe is from ſix grains to two ſcruples.

IF to one ounce of this magiſtery you put twelve ounces of ſpiritus nitri dulcis, and let them ſtand three days in digeſtion in a matraſs, ſhaking them now and then, after which draw off the ſpiritus nitri dulcis; and if you afterwards put upon it one pound and a half of ſpirit of wine tartarized, and let it ſtand twenty-four hours on warm ſand, and decant the ſpirit of wine; and laſtly, ſet it in an arch of a glaſs-houſe five or ſix days; it will have acquired a red colour, and be more diaphoretic, ſometimes a little cathartic; and I have heard, it has cured the venereal pox and gout, king's-evil, and leproſy. Its doſe the ſame as before.

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[n] It is worth enquiry, whether part of this ſulphur is not formed by a combination of the vitriolic acid, with the directly inflammable matter of the antimony, as Mr. *Hoffman* (from whom this proceſs is taken, ſee his *obſerv. phyſico-chym.* p. 272.) ſuppoſes. His reaſons are not to me altogether convincing: but this affair might be partly determined by employing a very fine regulus, inſtead of the crude antimony.

The Glaſs of Antimony.

TAKE a pound of antimony, and reduce it into fine powder, and ſet it over a gentle fire; calcine it in an unglazed pan, till it comes to be of an aſh-colour, and ceaſes to fume: you muſt keep it continually ſtirring; and if it ſhould run into lumps, you muſt powder them again, and then proceed to finiſh the calcination. When that is done, put the calcined antimony into a crucible; ſet it upon a tile in a wind-furnace; put a thin tile on the top, and cover it all over with coals°; when it is brought to fuſion, keep it ſo in a ſtrong fire for an hour; then put into it an iron rod, and when the melted antimony which adheres to it, is tranſparent, pour it upon a ſmooth hot marble, and when it is cold, put it up for uſe. This is vitrum antimonii, or ſtibium.

° Take great care that no coals, or any other inflammable matter, fall into the crucible; for this would reduce the glaſs back into antimony again.

ITS operation is emetic, and one of the ſtrongeſt that is prepared. Its doſe is from two to eight grains. It is uſed in infuſion like crocus metallorum, and given in the ſame caſes.

THE calcination requires care and patience; the fuſion muſt be ſtrong, and the quantity propoſed in the proceſs requires at leaſt two hours fire.

Purging Antimony.

TAKE four ounces of the glaſs of antimony, finely powdered; put to it gradually, twelve ounces of oil of vitriol; let it digeſt forty-eight hours: diſtil it in a ſand heat; let it cool; then waſh the powder, till all its acrimony is loſt; dry it, and grind it with an equal weight of ſal mirabile, and of ſal enixum a double quantity. Put this mixture into a crucible, which place in a wind-furnace: after it has ſtood a quarter of an hour in gentle fuſion, take it from the fire; when cold, waſh the powder, dry it, and keep it for uſe.

THIS is the moſt certain antimonial purge I ever met with. I have indeed tried many proceſſes, which have been confidently delivered to us by ſeveral authors of no ſmall reputation; but, till I invented this, I never met with one that anſwered my expectation. It operates without nauſeating the ſtomach. The doſe from two grains to half a ſcruple. By the uſe of this powder only, I have known three confirmed poxes cured within theſe two years.

The

The Tincture of Metals.

TAKE half a pound of regulus martis; of ſpittle-duſt (which is the ſcoriæ, that fall from hot plates of copper, quenched in water) four ounces; (or the like quantity of the caput mortuum of ſpirit of verdegreaſe) of ſalt-petre, two pounds; of tartar, half a pound. Powder and mix them well, and put them into a red hot crucible by ſpoonfuls: after the mixture has ſtood melting half an hour, remove it from the fire, and powder it in a clean warm mortar. Before it attracts the air, return it into a matraſs, and add two pounds of tartarized ſpirit of wine: make a circulating veſſel of the matraſs, and let it digeſt two days; when cool and ſettled, decant the tincture. The doſe from twenty to an hundred drops.

White Flowers of Antimony.

PREPARE a ſet of ſubliming pots, and let the lowermoſt be of the ſhape of an earthen body; it muſt be twelve or fourteen inches high, and its mouth three inches diameter: in the middle of this body muſt be a perforation of an inch and a quarter diameter, exactly fitted with a ſtopple of good earth. Place this upon an iron bar in a naked furnace, nine or ten inches above the grate, and cloſe the body to the perforation, with lutes and tiles, only leaving three or four regiſters of an inch and a quarter diameter, at an equal diſtance. Then fit to it three or four aludels of earth, one above another; and upon the uppermoſt aludel, fit a glaſs head with a beak: lute the junctures of the aludels, body and head; and to the beak, adapt a ſmall receiver unluted. Kindle the fire, and when the lower pot is red hot, put in of antimony in powder, about a ſpoonful, with a latten-ware ſcoop made for that purpoſe: keep up the fire well, and when you perceive no more fume to ariſe into the head, put in another ſpoonful; and ſo continue, till you have as much flowers as you deſire. When all is cold, take off the aludels carefully, and with a feather wipe off the flowers upon a ſheet of paper, and put them up for uſe.

THIS medicine is ſtrongly emetic, and ſo violent, that it is ſeldom given without correction. It is given to lunatics, alſo in agues. Its doſe is from two to five or ſix grains.

THIS operation requires attendance, for if you let the heat ſlacken, you will loſe both time and fire conſiderably, before you raiſe the flowers again.

" *Snow of Antimony, or the ſilver-coloured Flowers of the Regulus of Antimony.*

TAKE ſix ounces of regulus of antimony: break it to pieces, and put it into an unglazed earthen pot; about two or three fingers above the matter, fit an earthen cover pierced in the middle with a ſmall hole: cover the top of the pot with a lid, and place it in a ſmall furnace, ſo that the regulus may melt, and the bottom of the pot grow reddiſh: continue it in this condition about an hour, without being ſtirred, and then let the fire go out: when it is grown cold, take away the two covers, and you will find white flowers like ſnow, intermixed with fine ſhining needles, adhering to the ſurface of the regulus, which will remain in a maſs at the bottom of the pot; of theſe you will have a little more than a quarter of an ounce. Repeat this operation a ſecond time, and the flowers will ſublime in greater quantity. Reiterate the ſame operation ſucceſſively, till all the regulus is converted into flowers, which may be effected by a great number of ſublimations, at every one of which, the flowers will be in greater plenty. Sixteen ounces of regulus of antimony will yield about eleven ounces of theſe flowers, the reſt of it eſcaping through the junctures of the veſſels.

If too much fire be uſed, or the coals riſe too high round the ſides of the veſſel, the flowers will be yellowiſh, and as it were burnt: in ſuch a caſe, they muſt be put again to the regulus, and ſublimed afreſh. On the other hand, if the fire is too weak, you will gain but a ſmall quantity of flowers. The regulus remaining at the bottom of the pot, after a number of ſublimations, will be more bright and ſhining than before.

Lemery ſays, theſe flowers are not at all emetic or purgative, and differ little from diaphoretic antimony.

timony. *Geoffroy* ſays, they are diaphoretic, and promote ſweat, and are therefore given with good ſucceſs in malignant fevers. They cure intermitting fevers, exhibited a little before the paroxyſm. The doſe from ten to forty grains [p]."

Flowers of Regulus of Antimony, with Sal Armoniac.

TAKE regulus of antimony, and clean ſal armoniac, ana half a pound; powder and mix them well; and in all things proceed as in making the white flowers. When you wipe the flowers from the aludels, put them into clean water, to diſſolve the ſal armoniac, and waſh the flowers from the ſalt; dry them, and put them up in a vial for uſe. They are not ſo violent as the white flowers, and given in the ſame caſes.

IF you deſire but a ſmall quantity of theſe flowers, you may perform the operation in a ſand-furnace, by putting the matter into a retort, fitting to it a receiver, and proceeding with a gradual fire as you do in the preparation of ens martis.

Antimonium Reſuſcitatum, or Antimony revived.

TAKE the foregoing flowers of antimony and ſal armoniac, without ſeparation; put them into a cucurbit, and to every four ounces of them, put of diſtilled vinegar, one pound: let them ſtand upon warm ſand in digeſtion, eight days; then exhale the diſtilled vinegar, and by ablution ſweeten the flowers, which then will be of the priſtine colour of antimony, and are accounted a very good medicine.

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[p] Mater. med. vol. I. p. 230.

THIS preparation is emetic, and ſometimes diaphoretic. It is adminiſtred in the ſcurvy, dropſy, jaundice, agues, fevers, and conſumptions. Its doſe is from four to ten grains.

IF you make this medicine of the flowers of regulus, it will be milder than that made of crude antimony, becauſe much of its crude ſulphur is evaporated in the preparation of the regulus.

Dr. B'*s Panacæa of Antimony.*

TAKE of antimony, ſix ounces; of nitre, ten ounces, of common ſalt, one ounce and an half; and of charcoal, an ounce: let them all be made into fine powder, well mixed, and put into a red hot crucible, by half a ſpoonful at a time. Continue the fire a quarter of an hour; then pour the matter into a cone, or let it cool in the crucible, and you will find three ſubſtances, *viz.* in the bottom, a little regulus; above that, a compact matter, ſomething like the liver of antimony; upon the ſurface, a more ſpongy maſs: ſeparate them from one another, and put by the regulus. Powder the other two, and waſh them apart, till they have no taſte of the ſalts: dry them gently, and keep for uſe.

The uppermoſt ſubſtance is accounted the beſt, and is of a fine golden colour, when it is waſhed. The middle ſubſtance is not of ſo pleaſant a colour, and works more churliſhly. The regulus is equal with the regulus of antimony.

Its operation is emetic and cathartic, and it is given in the venereal pox, gout, dropſy, ſcurvy, and all intermitting fevers. Its doſe is from two to five or ſix grains. This is what Mr. *Lockyer* aimed at in the compoſition of his pill, by which he got a good eſtate. If you mix ten grains of the finer ſort of this preparation, with one ounce of white ſugar-candy, in impalpable powder, and make them up into a maſs, you may divide them into a hundred pills; and one, two, or three of theſe will work gently by ſtool and vomit. The mucilage of gum tragacanth is proper to make up the paſte.

The Panacæa of Antimony without Fire.

TAKE four ounces of antimony; grind it to a moſt ſubtile powder; put it into a matraſs, and pour upon it one pound of ſtrong capital lees of the ſoap-boilers: ſet them to digeſt on warm ſand four or five days, and ſhake them often; then add ſome warm fountain water; ſhake the mixture well about: let it ſtand two or three ſeconds of time, and pour it off into a clean pan. Repeat the ablution, till all the brown powder is ſeparated from that which appears like crude antimony; to which put more capital lees, and ſo proceed in all things as before,

fore, till all the antimony is brought into a ſubtile brown powder, which waſh well from its ſalts; dry it, and keep it for uſe.

Its operation is ſometimes diaphoretic, other times diuretic; and alſo cathartic and emetic. Its virtues are the ſame with other antimonial preparations; and it is frequently given as a ſuccedaneum to that called *Ruſſel*'s powder. Its doſe is from five to twenty or thirty grains.

Reduce the antimony into a moſt ſubtile powder, and ſee that the capital lees and veſſel be clean, and you cannot err in this operation.

The Butter, or Icy Oil of Antimony, and its Cinnabar.

TAKE of antimony and mercury ſublimate ana two pounds[q]; powder and mix them well; put them into a coated retort, which muſt not be charged above a third part; ſet it upon an iron bar, in a little flat diſh with ſome ſand in it, in an open furnace: make a ſmall fire at firſt; which increaſe gradually in the ſecond degree, and the butter will riſe into the neck of the retort, which melt into the receiver with live coals. Keep the fire ſtill in that degree, till you perceive the neck of the retort tinged red: then change the receiver, and increaſe the fire to the third degree, where keep it two hours; after that, give two hours fire of the fourth, and it will raiſe the cinnabar into the neck of the retort. When all is cold, take it out of the furnace, break the retort, and take out the cinnabar.

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[q] The proportion of antimony to the mercury, is here greatly too large. *Stahl* aſſerts, that one part of antimony is enough for four of ſublimate. There are ſome circumſtances which ought diligently to be obſerved, to make this dangerous proceſs practicable with ſafety. A low bodied retort, with a very wide and ſhort neck, ſhould be choſen for this purpoſe; and a ſand-furnace is preferable to an open fire; for in the former the heat is more eaſily regulated than in the other, and is not ſo apt to increaſe ſuddenly; which might raiſe the matter ſo faſt, as to endanger the blocking up the neck of the veſſel, and burſting the glaſs. After the butter is all cautiouſly melted into the receiver, and no more is perceived to ariſe, the fire may be put out; and the retort being broken, the caput mortuum may conveniently be ſublimed into cinnabar, in a common bolt-head luted, and placed upon a naked fire.

THE butter is only uſed externally as a cauſtic, and is a noble ſecret to ſtop mortifications. The cinnabar is a diaphoretic; the doſe from ſix grains to one ſcruple.

THE true cinnabar of antimony is ſcarce to be found even among chemiſts. The compoſition of the ſpurious cinnabar is as followeth: take fifteen pounds of crude mercury, five pounds of common ſulphur, crude antimony in ſubtile powder, one pound and a half; mix them well, and ſublime them in a luted bolt-head in a naked fire. This cinnabar is of a finer colour, and more eaſy to be pulverized than native cinnabar.

WHEN you mix the ſublimate with the antimony, muffle yourſelf for a defence againſt the ſteam of the ſublimate; and alſo carefully avoid the fumes of the butter, when you change the receiver [r].

Mercurius Vitæ.

LET the butter of antimony be melted, either by the air, or a gentle heat: put it into a clean retort, ſet it in a ſand-furnace, and by a fire of the ſecond degree diſtill it; the butter will be made more white and pure, and by this rectification be ſeparated from ſome dirty feces, which will remain in the bottom of the retort. Melt all the rectified butter into the receiver, and put to it warm fountain water; ſtir it well with a clean ſtick: when it is ſettled, pour off by inclination, and keep the firſt by itſelf. Put on more water, ſtir, and let it ſettle; and ſo do till the powder is freed from all

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[r] It is a neceſſary caution to diligently avoid the fumes, which ariſe on the mixture of the antimony with the ſublimate; for they are not only extremely poiſonous, but ſometimes riſe ſo ſuddenly, and in ſuch great quantity, as difficultly to be avoided. The muffling one's ſelf, as *Wilſon* directs, is but a poor defence againſt them: the beſt is to mix the ingredients but ſlightly, (which will be ſufficient) and in but ſmall quantities, in an airy place, or under a good chimney; or they may be as well ſhook together, after they are put in the diſtilling veſſel, and, as ſoon as the fumes are perceived to ariſe, the recipient luted to it. If the cinnabar is not wanted, this preparation may be made, at a cheaper rate, of a ſolution of antimony in aqua regia, as hinted in the *Pharmacopæia Reformata*, p 94. This ſolution being warily made, and ſlowly diſtilled, firſt a phlegmy liquor will ariſe, and afterwards, upon increaſing the heat, the butter, very little being left at the bottom of the retort.

ſaltiſh taſte; then dry it gently, and keep for uſe.

ITS operation is emetic. Its virtues are the ſame with the flowers of antimony. Its doſe from two to eight grains.

IF you have a pound of butter, put not above four pounds of water to it, for the firſt ablution: ſtir it often with a clean wooden ſpatula, to break its coagulum; then let it ſtand to ſettle, and carefully pour off the water; of which, by rectification, is made the philoſophic ſpirit of vitriol[s].

Mineral Bezoar.

TAKE four ounces of rectified butter of antimony; put it into a retort, and to it twelve or ſixteen ounces of ſpirit of nitre, or aqua ſtygia, by two or three ounces at a time. Place the retort in a chimney, to avoid the hurtful fumes. When all the ſpirit of nitre is in, and the vehemence of its action is over, put it in a ſand-furnace; fit and lute a receiver to it, and give a gradual fire to the third degree. When it ceaſes to drop, let out the fire, and when cold, take it out, and keep it in a glaſs well ſtopt from the air.

ITS operation is ſudorific; which operation it performs more ſenſibly than diaphoretic antimony[t].

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[s] This preparation is little other than the butter of antimony, that is the reguline parts of antimony blended with a concentrated ſpirit of ſalt, ſomewhat weakened by the ablution; and therefore is juſtly to be eſteemed a dangerous preparation.

[t] There does not ſeem to be any conſiderable difference between

It is accounted a great reſiſter of poiſon, and given in all peſtilential diſtempers. Its doſe is from ten grains to two ſcruples, even to a dram.

SOME calcine it in a crucible, after it is taken out of the retort: others think it is better to let that part of the ſpirit of nitre that it holds, to remain with it.

LUTE not on the receiver, till the violence of the fumes is over, leſt when the fire augments its motion, it break the retort or receiver. Do not exceed the third degree of fire, nor let it ſtand long in, after the ſpirit of nitre is drawn off, to prevent diſcolouring the bezoardicum minerale. The ſpirit of nitre being now impregnated with the ſpirit of common ſalt, which was in the butter, is become an aqua regia, and will diſſolve gold, and is called ſpiritus nitri bezoardicus [u].

Oil of Antimony, with Sugar-candy.

TAKE of antimony and ſugar-candy, of each one pound; let them be well powdered, and

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tween the two; and accordingly the latter has generally ſupplied the place of the former.

[u] This preparation is more conveniently made by dropping the butter of antimony ſlowly into the ſpirit of nitre previouſly diluted with a ſmall portion of water; by this means the noxious fumes, which ariſe in great abundance if the proceſs be performed in the manner above directed, are prevented. It ſeems at firſt ſomewhat extraordinary, that the very corroſive preparation, butter of antimony ſhould be rendered ſoft and taſteleſs by the addition of another corroſive, ſpirit of nitre. This is accounted for in the *Pharmacopœia Reformata,* ſee p. 96.

mixed with three pounds of clean dry ſand; put them in a retort, leaving it above half empty; ſet it in a ſand-furnace, and with a bladder dipt in the white of an egg: increaſe the fire to the ſecond degree, and ſo keep it one hour; then to the third, in which continue it two hours; and ſo proceed to the fourth two hours more, which will finiſh the operation. When all is cold, take out the liquor, and keep for uſe.

IT cleans ulcers and tettars; it alſo kills the itch.

THE ſand is mixed with the antimony and ſugar, to hinder the matter from boiling over, which it would be very apt to do without the ſand: If you would have it freed from its empyreuma, and fit for internal uſe, weigh the oil and ſpirit, and put to it a third part of its weight of ſpiritus nitri dulcis. Set it in a matraſs, upon warm ſand, in digeſtion, four or five days; then put it into a long bodied retort, or cucurbit, with its head and receiver: lute the joints; give gradual fire to the third degree, which keep, till it leaves dropping; then put up the ſpirit for uſe.

IT is accounted an excellent remedy againſt all intermitting fevers, eſpecially quartan. Its operation is gently emetic and cathartic. Its doſe is from five to fifty drops.

The Eſſence of Antimony.

TAKE the flowers of antimony, or mercurius vitæ, and ſal mirabile, of each one ounce; of clean cryſtals of tartar, two ounces; of ſugar-candy, four ounces; powder and grind them well together, put them in a clean pan, with three pints of ſpring-water; let them ſimmer over a fire for eight or ten hours, and ſtir them often. Filtre the liquor while it is warm, and evaporate it in a gentle heat, to the conſiſtence of a ſyrup: then put to it a pint of ſpirit of wine; let it ſtand in digeſtion in a matraſs well ſtopt, three days; in which time it will be well tinged: then by gentle inclination pour off the tincture into a body, to which fit a head and receiver, and draw off one half of the ſpirit of wine; that which remains in the body put into a vial, and keep for uſe.

ITS operation is emetic and cathartic, and is given in all diſeaſes wherein antimonial medicines are proper. Its doſe from five to fifty drops, in ale, wine, milk, or water. As the liquor evaporates in boiling, take care to ſupply it with clean warm water, till it is fit to be filtred.

The Tincture of Antimony.

PUT half a pound of ſalt of tartar into a crucible; ſet it in a melting furnace, and heat it till it melts; then put to it (by a ſpoonful at a time) four ounces of antimony in powder; let it ſtand in a ſtrong melting heat, the ſpace of one hour: take it from the fire, and put it into a warm mortar; beat it to powder, and whilſt warm, put it into a matraſs; pour upon it tartarized ſpirit of wine, one pound; and invert a glaſs into the mouth of the cucurbit; lute it well, and ſet it in digeſtion three or four days, in which time the ſpirit of wine will be tinged: take it from the heat, ſet it on one ſide to ſettle, and decant it into a dry vial, which keep well ſtopt for uſe.

ITS operation is diaphoretic and diuretic, it opens the obſtructions of women, is good againſt hypochondriac melancholy, ſmall-pox, and malignant fevers. Its doſe is from ten to fifty or ſixty drops.

Tinctura Regalis.

TAKE of copper in little pieces, two ounces; put it into a crucible, ſet it in a melting furnace; when it is red hot, put to it (in groſs powder) fourteen ounces of regulus jovis; let them melt well together the ſpace of a quarter of an hour; then caſt them into a warm greaſed cone: when cold, beat them into powder, which muſt be put (by a ſpoonful at a time) into double its weight of melted ſalt of tartar. When it is all in, ſhut the door of your melting furnace, and keep it in the ſtrongeſt fire you can give for two or three hours: then take it from the fire, and pour it into a clean warm iron mortar; beat it to powder whilſt warm, and before it attracts any air, put it in a matraſs where there is one pound of ſpirit of wine tartarized; lute it as you did the tinctura antimonii, and in all things proceed as in that tincture.

Its operation is ſudorific and diuretic; ſome think it almoſt an univerſal medicine, and indeed I have known it ſucceſsfully uſed in ſeveral diſtempers. Its doſe is the ſame with the tincture of metals.

If you would produce this tincture in leſs time than the proceſs directs, let it ſtand in ſuch a heat as will keep the ſpirit of wine ſimmering, five or ſix hours, and the tincture will be extracted. In the place of two ounces of copper, if you put two ounces and a half of the ſcoriæ of copper (which the braſiers call ſpill-duſt) you will have a more glorious tincture.

The Sulphur of Metals.

TAKE four ounces of nitre, of ſulphur two ounces, and one ounce of ſalt of tartar; powder and mix them well; then take of the regulus of mars and venus (purified by repeated fuſions) four ounces; powder the regulus alſo very finely, and mix it exactly with the other powder. Put the mixture into a red hot crucible, by a quarter of a ſpoonful at a time. When it has ſtood half a quarter of an hour in fuſion, remove it, and when cold, reduce it into a fine powder: then put it into a glaſs body, and add two quarts of ſpring water, ſet it in a ſand heat to diſſolve the ſalt and ſulphur. Filtre the diſſolution, and precipitate the ſulphur with any acid; waſh and dry it *ſ. a.* for uſe.

THIS is a true ſulphur of metals, it is anodyne and diaphoretic. The doſe from five grains to one dram.

SOME are of opinion, that the emetic quality of antimony is not to be ſo far deſtroyed by any preparation, but that it will return again, when it has been kept for ſome time, or expoſed to the air: but I have kept ſeveral of the foregoing preparations, and eſpecially the tinctures, many years, without any ſenſible alteration.

CHAP. XI.

Of Lapis Calaminaris.

IT dries, binds, and cleanſes; fills ulcers with fleſh, and is a good ophthalmic; it incorporates with copper, and makes braſs. It is found in the north parts of *Germany*, in the north of *Wales*, and in the weſt of *England*. Internally it is not much uſed; although it affords one of the beſt emetics and diaphoretics, commonly known [w].

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[w] Calamine is a foſſil ſubſtance, of a conſiſtence between ſtone and earth, found in great abundance in the lead mines. Its ſpecific gravity is to that of water as 4,690 to 1,000. It is yellow, gold-coloured, red, ſometimes grey, or even of a colour which

Preparations of Lapis Calaminaris.

The Magiſtery of Lapis Calaminaris.

TAKE four ounces of lapis calaminaris, beat into fine powder; put it into a matraſs, and pour upon it, one pound of ſpirit of ſalt: let them digeſt upon warm ſand forty-eight hours; filtre the diſſolution, and precipitate the magiſtery with ſpirit of urine; free it from its ſalts, by ſeveral ablutions; dry it gently, and keep for uſe.

ITS operation is emetic and cathartic, and is uſed in all caſes wherein antimonial emetics are proper. Its doſe is from three to eight grains.

LET the ſpirit of ſalt be rectified, becauſe in the firſt diſtillation there is mixed with it a foul ſulphur or flower, which may diſcolour the magiſtery.

Diaphoretic

which is a mixture of all the foregoing. Broken to pieces, and thrown into a violent fire, it immediately renders the flame of a beautiful green colour, and exhales a thick, white, copious ſmoke, of a ſweet ſmell peculiar to it, and vaſtly aſtringent, which condenſes into very light flowers, at firſt of a bluiſh, and afterwards of a greyiſh white colour: theſe flowers are ſuppoſed to be the pompholyx of the ancients, ſee *Neri*'s *art of glaſs*, tranſlated by Dr. *Merret*, p. 300. Calamine contains likewiſe, beſides theſe, an unmetallic earth, and a good deal of iron; ſome of it is attracted by the loadſtone: *Geoffroy (Mat. Med. tom.* I. p. 206.) looks upon it as an iron ore. Calcined with plates of copper, it turns them of a yellow colour, and increaſes their weight ſometimes one fourth, and ſometimes even a third.

Diaphoretic Calaminaris.

BEAT four ounces of lapis calaminaris into fine powder; put it into a matraſs (which place in a chimney) and put to it (by three or four ounces at a time) one pound of ſpirit of nitre: let it ſtand, covered from dirt falling into it, twenty-four hours; then decant the liquor, which put into a retort; ſet it in a ſand furnace, and give it gradual heat to the third degree; and ſo keep it, till no drops fall from it. When all is cold, take it out of the retort, and keep for uſe.

IT is a good ſudorific, and anſwers the purpoſes of antimonial diaphoretics. It is alſo an excellent collyrium, one ounce of it being infuſed twenty-four hours in half a pint of white-wine, and a drop or two of that infuſion put into the eye, three or four times a day. Its doſe is from ten grains to half a dram.

SOME perſons will waſh the diaphoretic calaminaris, when taken out of the retort; others will put to it three times its weight of tartarized ſpirit of wine, and let it ſtand in digeſtion twenty-four hours, ſhaking it often, and then let it ſimmer one hour, and when cold, pour off the ſpirit of wine, and dry by a gentle heat the diaphoretic, which they keep for uſe. It is a good diaphoretic. Its doſe is from ten to forty or fifty grains.

CHAP.

CHAP. XII.

Of VITRIOL.

AT *Friburg* in *Germany*, they take the ore, out of which brimſtone hath been melted, and burn it again in open air; then putting it into a large fat, they pour water upon it, ſo as to imbibe and drink in the vitriol: This water is afterwards boiled to a ſufficient height, and let out into coolers, where ſticks are ſet in it, as in the making the ſugar-candy: the pureſt cryſtallized vitriol, ſticks to the wood, the reſt to the ſides and bottom. *Vid.* Dr. *Brown*'s *Travels*, p. 170, 171.

OF vitriols, we have ſix ſorts vendible among us, *viz.* *Hungarian*, *Dantzick*, *Roman* or *Cyprus*, *Engliſh* and *German*, and likewiſe white vitriol. It is ſaid, they are all compoſed of an acid ſalt, and ſulphureous earth; but it is moſt certain, that there is a proportion of metal in them, as it evidently appears by rubbing *Dantzick*, *Hungarian*, *Roman*, and white vitriol, upon the blade of a knife, which they will leave tinged of a copper colour. And in *London* it is well known, that moſt of the old iron which is gathered by many poor people, is ſold to the copperas-houſes at *Rotherith* and *Deptford*, which they boil up with the diſſolution of the marcaſite pyritis, or fire-ſtone. In colour, the *Hungarian* and *Dantzick* are green, but the firſt is the deeper: The *Roman* or *Cyprus* is blue; the *Engliſh* is yet of a paler green than either. The white takes its name from its colour. There is alſo a red vitriol, which is that of *Germany*, and yet of no great uſe amongſt us: It is ſuppoſed to be a green vitriol, calcined by a ſubterranean heat[x].

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[x] The blue vitriol which is at preſent in uſe among us, is not brought from abroad, but prepared in *England.* Its cryſtals are not ſo perfect as the foreign ſort. Expoſed to the fire, it does not melt like green vitriol: it firſt turns white, then of a yellowiſh red on the outſide, and, upon increaſing the fire, an acid vapour exhales, leaving behind it a dark red calx. Blue vitriol is ſaid to be found ſometimes naturally formed, in great quantity, in the copper mines in *Germany*.——White vitriol, which has, till of late, been ſuppoſed to be an artificial preparation of the common green vitriol, is prepared at *Goſlar* in *Germany*, from a particular kind of lead ore, though ſometimes it is found native in the mines. There appears to be a ſmall quantity of copper and iron in it: but they both ſeparate from it in its purification. Purified, it appears to be a vitriol of a particular kind. ——Green vitriol is ſometimes found native in the bowels of the earth; but the ſort commonly met with is artificially prepared from the pyrites and iron. This ſort, being expoſed to a ſoft fire, runs into a liquid form, and, its aqueous parts exhaling, becomes a white calx: upon increaſing the fire, an acid vapour ariſes, its calx becomes red, and at length, in an intenſe fire, aſſumes a purpliſh colour.——There is another ſort of vitriol brought from *Dantzick*, which is of a colour betwixt the blue and the green. This appears, upon examination, to contain a ſmall quantity of copper, and a larger one of iron. Upon diſſolving this vitriol in water, and ſlowly evaporating the ſolution till a pellicle is formed upon its ſurface, the cupreous parts ſubſide; and a pure vitriol of iron ſhoots, upon ſetting the remaining liquor to cryſtallize.

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The Purification of Vitriol.

ALL vitriols are made pure by diſſolution "in water," filtration, evaporation, and coagulation, or cryſtallization. If you would purify them to the height, you muſt ſo often repeat the operations, that by ten days digeſtion between each diſſolution, there will ſettle no feces.

Calcination of Vitriol.

PUT what quantity of green vitriol you pleaſe into an earthen pot; make a gradual fire under it, and as it heats, it will diſſolve: continue the fire, and increaſe it, till the liquor is again coagulated, and the maſs of a greyiſh colour.

THIS is calcined vitriol, fit for ſome uſes: but if you deſign it for the diſtillation of its oil, or for calcanthum rubefactum, you muſt continue it in a ſtrong fire, till it is very red. It is uſed to ſtop blood, being applied to the wound.

IN the calcination begin with a very gentle fire, till the vitriol is melted; then increaſe it leiſurely till

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The acid liquor extracted from vitriol by a chemical analyſis, appears to be perfectly ſimilar, whatever vitriol it be obtained from. Their various colours are owing to the mineral or metallic parts contained in them: the blue colour ſprings from copper; the green from iron; the bluiſh green from a mixture of both; the baſis of the white vitriol is probably calamine. Each of theſe vitriols contains in its cryſtalline form different quantities of an aqueous fluid: the blue vitriol contains the leaſt; the green, the moſt, and the bluiſh green a middle quantity betwixt the two.

till it begins to cruſt about the ſides of the veſſel; otherwiſe you may crack the pan, and the liquor will run out; but after it is coagulated about the ſides of the pan, you may increaſe the fire boldly.

The Diſtillation of Oil [y] *and Spirit of Vitriol.*

BEAT the colcothar to powder, and ſift it through a coarſe hair-ſieve; then put into thoſe pots called long-necks, five or ſix pounds apiece

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[y] The acid which is extracted from vitriol, ſulphur, and alum, appears from various experiments to be of one and the ſame kind. Its gravity is the greateſt of all fluids, except mercury, to which it is nearly as 1,877½ to 14,000. When highly concentrated, it ſtrongly imbibes moiſture from the air, ſo as to increaſe its bulk very ſurpriſingly: expoſed, in this condition, to a ſoft fire, it again lets go the water which it imbibed; but requires, for this purpoſe, a good deal more heat than is neceſſary to evaporate ſimple water: if the fire be pretty quickly raiſed, great part of the ponderous acid will ariſe with the water. This acid ſtrongly acts upon the directly inflammable part of bodies, and with it combines into a perfect ſulphur, (ſee the following article *Sulphur*). Mixed with a fixt alkaline ſalt, it is converted into a neutral ſalt, difficultly ſoluble in water, although the latter as ſtrongly affects the moiſture of the air, as the former. It powerfully diſſolves certain earthy ſubſtances, and ſeparates them when conjoined with other matters, (ſee *Glauber*'s *ſpirit of nitre*, *ſpirit of ſalt*, and *concentrated ſpirit of vinegar*). It diſſolves, or corrodes, all metallic ſubſtances, except gold, but more readily one than the other, and in the following order; zinc, iron, copper, ſilver, tin, regulus of

piece of calcined vitriol, and place them in a reverberatory furnace : lute on the receivers, with lutes made of clay, ſand, and cut flax; then make a ſmall fire under the grate, with charcoal and ſmallcoal; ſtop the fire-hole of the furnace, and the aſh-hole ſlightly : let the fire ſmother ſo ſix or eight hours, to dry the furnace and junctures of the receivers : then put the fire upon the grate, and keep it in the firſt degree ſix or eight hours; increaſe it to the ſecond, four or five hours, and ſo to the third, which will raiſe white clouds into the receiver : continue it ſo long as you ſee white clouds come over; when they begin to abate, augment it to the fourth degree in its extremity, and continue it till the vitriol emits no fumes. Then let all cool, and carefully take off the receivers, and put the diſtillation into a retort, which place in a ſand-furnace; fit a receiver without luting; make a gentle fire, which will raiſe a little inſipid phlegm, which has a ſulphureous ſmell; put that into a vial, and ſtop it. Put on the receiver again, and continue the ſecond degree of fire, and ſo paſs on to the third, which continue till fumes riſe into the receiver, and you perceive the oil in the retort to be clear and white as rock water : then let all cool, and put the ſpirit

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of antimony, mercury, lead. But various circumſtances muſt be obſerved to make the ſolution ſucceed; thus, it ſcarce acts upon iron, till diluted with water; and not upon mercury, without being highly dephlegmated : with zinc it effervеſces in a very extraordinary manner, without heat; but affects not ſilver in the leaſt, unleſs it be made to boil.

ſpirit by itſelf, and the oil left in the retort by itſelf alſo[z].

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[z] This oil, or liquor, is generally found to participate ſomewhat of the metal of which the vitriol was compoſed, and likewiſe to contain a large portion of phlegm; from both which, if this preparation is deſigned for curious purpoſes, it ſhould be ſeparated by a careful rectification. This is not to be undertaken without a good deal of circumſpection and care; for this proceſs is attended with conſiderable danger, but may be ſafely and ſucceſsfully performed, if the following directions are diligently attended to.——Chooſe a low bodied retort, free from blebs and ſmall ſtones; let it be no bigger than will juſt hold the quantity of acid you intend to purify: place this upon a little ſand (no more than is neceſſary to keep it ſteady) in an iron pot, ſo that the retort may almoſt touch the bottom, and juſt come clear of the ſide. Adapt a recipient, without luting the junctures. Apply a gradual fire, till ſuch time as the receiver grows ſenſibly hot, and the phlegmy vapour trickles down its ſides: ſteadily keep up this degree of heat, without at all increaſing it, till the receiver begins to grow ſomewhat cooler, and no more vapour ariſes: then cautiouſly pour out the liquor which has come over, and carefully lute on the recipient: raiſe the fire, till the receiver grows too hot to be long endured: keep up the fire, without ſuffering it once to ſink, till all the liquor is diſtilled.—Obſerve never to rectify above three or four pounds at a time; and that no cold air comes either to the retort or the receiver, which may conveniently be placed upon a little ſand in a ſtone pan, that if it ſhould break, the diſtilled liquor may not be loſt.

The trouble with which this proceſs is attended, may poſſibly recommend the following more facile one.—Put twice as much water as you intend to rectify of oil of vitriol, in a ſtone bottle: to this by degrees add the oil. When all the mixture is become cool, pour it into a glaſs retort: lute on a receiver with a pipe to it, the pipe being turned uppermoſt. Apply gradually ſuch a fire

THE ſulphureous ſpirit is given in palſies, and diſeaſes of the lungs. The ſpirit is commonly mixt with juleps. In phyſic, the oil is of the ſame uſe as the ſpirit, in an eighth or tenth part of the doſe.

IF the vitriol be only calcined to greyneſs (as ſome direct) it will coagulate in the pots, and become a hard maſs; ſo that the fire, though ever ſo vehement, is hindred from acting upon its particles, by the compactneſs of the matter, and will never raiſe the full ſtrength of the ſpirit in twenty days time: therefore it ought to be calcined to redneſs, and beaten into powder, and put into the pots before it attracts air [a].

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fire as may make the matter diſtil pretty faſt: ſteadily keep up this heat, till almoſt all the liquor is come over, and no more vapour will ariſe with the ſame degree of heat. Let the whole cool, and you will find almoſt all the oil of vitriol come over mingled with the water, a ſmall quantity only remaining in the retort. The diſtilled liquor is perfectly freed from any metalline taint; and may be made of any degree of ſtrength by ſimple evaporation in a glaſs or ſtone veſſel ſet in a very gentle heat.

[a] The preparation of oil of vitriol has become a diſtinct branch of the chemical buſineſs, and conſiderable works have been erected in ſuch parts of the kingdom, where fuel could be moſt eaſily procured. Some of the furnaces are ſo large, as to contain an hundred long-necks at once. After the diſtillation is over, the caput mortuum is ground down in mills contrived for that purpoſe, and carefully edulcorated with water; the remainder being made up into cakes, and dried, is employed as a pigment.

" *An eaſier Method of diſtilling Oil of Vitriol.*

DISSOLVE as much as you pleaſe of common green vitriol, in a ſufficient quantity of boiling water: into this ſolution throw, by degrees, ſome zinc in fine powder, which will ſoon be diſſolved, and a precipitation of the iron enſue: decant the liquor, and add ſome more zinc to it; a ſecond precipitation will ſoon enſue: continue this proceſs, till the zinc is no longer acted upon. Evaporate the liquor ſlowly, till a ſalt appears: gently calcine the ſalt, till perfectly dry. With this fill a low retort, with a wide neck: place it in a ſand-furnace, and apply a gradual fire: continue this till the receiver grows cool."

Gilla Vitrioli, commonly called, Salt of Vitriol.

DISSOLVE what quantity of white vitriol you pleaſe in warm fountain water; filtre it, and let it ſtand warm twenty-four hours to ſettle its feces: decant it off from the ſediment, and evaporate it to a pellicle in an earthen pan. If you ſee ſtill ſome yellow feces at the bottom of the pan, pour it out into a clean veſſel by gentle inclination, and ſet it two or three days in a cold place to ſhoot into cryſtals.

ITS operation is emetic. Its doſe from ten grains to one dram. There is a ſalt extracted with warm water from the caput mortuum of the oil of vitriol, which is very little (if at all) in uſe.

THE gilla, or (what we call) ſalt of vitriol, ought to be diſſolved in no more water than will keep it from cryſtallizing while it ſtands to ſettle, *viz.* two pounds, or two pounds and a half of water, to one pound of vitriol.

The compound cathartic Salt of Vitriol, and its Sulphur.

DISSOLVE what quantity you pleaſe of common martial vitriol; filtre the diſſolution, and put it into a matraſs; ſet it in digeſtion fifteen days: if any feces fall in that time, carefully decant the liquor from them into a clean veſſel, and drop into it as much oil of tartar, as will precipitate all its ſulphur [b], which you will ſee fall into a brown powder. Let it ſettle, and pour off the clear liquor. Evaporate it to a pellicle, and ſet it by in a cold place to ſhoot into cryſtals [c].

THE operation of the ſalt is cathartic and diuretic. Its doſe is from ten grains to two ſcruples, or one dram. It is a very aperitive and cleanſing medicine. The ſulphur is the ſame with that of mars before mentioned.

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[b] This is the metallic part of the vitriol, in the form of a crocus, or calx.

[c] Theſe cryſtals are perfectly the ſame with tartarus vitriolatus, which ſee. They are compoſed of the acid of the vitriol and ſalt of tartar, and contain nothing metallic.

THE long digeſtion is to make the more groſs metallic part ſettle to the bottom; the better it is ſeparated from that metallic part, the leſs emetic, and more cathartic it is rendered. The precipitated matter muſt, by many ablutions, be rendered taſteleſs, and gently dried.

Aqua Styptica.

TAKE colcothar, burnt alum, and ſugar-candy, ana one dram; urine of a ſound perſon, and roſe-water ana one ounce; plantain-water four ounces; grind all well together in a mortar, till the mixture is without the leaſt lump; then put it into a matraſs, and let it ſtand in digeſtion twenty-four hours; let it ſettle, and pour it from the feces. If you would have it more ſtyptic, put one dram of the liquor left after the laſt ſhooting of ſal chalybis, or vitriolum martis, to it.

THE liquor left after the ſhooting of vitriol of iron, is both more ſtyptic and vulnerary (by its impregnation with the ſulphur of mars) than the oil of vitriol is of itſelf[d].

Spiritus

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[d] This compoſition is taken from *Lemery*, who ſays he has frequently experienced the good effects of it. The two diſtilled waters are certainly not better than common water. It ſeems to be no more than a ſolution of alum, which is every jot as good.

Spiritus Vitrioli Dulcis.

PUT into a matraſs, ſpirit of wine two pounds, and pour into it one pound of oil of vitriol, by an ounce at a time; fit and lute on a head and receiver: kindle the fire, which increaſe gradually to the third degree, till no drops fall from the noſe of the head; then take it from the fire, and put what is diſtilled into a vial well ſtopt. Some will return the ſpirit upon the black matter left in the body, and draw it over again; and ſo do three or four times, till nothing is left but a dry, black cruſt [e].

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[e] The oil of vitriol bears much too large a proportion to the inflammable ſpirit. The compilers of the *Edinburgh Diſpenſatory*, ſenſible of this, have directed only one part of oil of vitriol, to eight of a rectified ſpirit: this proportion *Boerhaave* likewiſe obſerves. The uſual directions and cautions given for the management of this ticklish proceſs, are very inaccurate and inſufficient. A retort, capable of holding ſix times the quantity of the ingredients, is preferable to a matraſs: to this ſhould be adapted a receiver with a pipe, ſo placed, that the condenſed vapour may immediately paſs into a ſmall vial, into which the end of the pipe, which ſhould be very ſlender, is inſerted. Place the retort no deeper in ſand, than will juſt keep it ſteady, that it may be commodiouſly removed, in caſe the heat ſhould prove too great. After the ingredients have ſtood in digeſtion a due time, increaſe the heat by degrees, ſo that one drop may ſlowly follow another, into the ſmall receiver or vial, which is to be placed ſo as to be eaſily removed. As ſoon as the drops taſte acid, the ſweet ſpirit of vitriol is all come over.

ITS operation is diaphoretic and diuretic. Its doſe from twenty to an hundred drops, in a large quantity of liquor.

IF you cohobate the ſweet ſpirit of vitriol upon the black reſidence left in the bottom of the retort, it exalts its virtue.

The diaphoretic Spirit of Vitriol.

TAKE of ſalt of tartar, and burnt harts-horn, ana two ounces; put them into a matraſs, and add to them, by little and little, half a pound of the foregoing ſpiritus vitrioli dulcis; ſet the mixture in a ſand-furnace, fit a head and receiver, lute well the junctures, and draw it off to a dry bottom, in a fire of the ſecond degree: then take off the ſpirit, and put to it ſaffron and cochineal ana one ounce, Virginia ſnake-root half an ounce, ſtop the veſſel well; ſet it upon warm ſand to digeſt twenty-four hours, ſometimes ſhaking it: afterwards let it ſettle, and keep it in a vial well ſtopt [f].

ITS operation is diaphoretic and diuretic. It is given in all fevers, and even in the plague itſelf, with good ſucceſs: alſo in dropſies and the jaundice.

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[f] The ſalt of tartar and the burnt hartſhorn, abſorb the phlegmy acid liquor, which comes over with the ſpirit of wine, and conſequently make it more fit to act as a menſtruum on the cochineal, *&c.* The burnt hartſhorn and the cochineal might be omitted, without impairing the medicinal virtues of this preparation, which, in all probability, are very conſiderable.

dice. It powerfully opens obſtructions, and cleanſes the lungs. Its doſe is from thirty to one hundred and twenty drops.

Let the ſalt of tartar be clean, and the hartshorn well burnt, and put not above one ounce of the dulcified ſpirit of vitriol to the ſalt and calx at a time.

The Medicinal Stone.

TAKE common green vitriol half a pound, and the ſame quantity of white vitriol, of alum twelve ounces, anatron or ſandiver, and common ſalt ana one ounce and a half, ſalt of tartar two ounces; beat them groſly, mix them with four ounces of vinegar, and put all into an earthen pan, which will contain three times their quantity: ſet them in a fire to melt, and ſtir them often; when they begin to thicken, mix diligently of Venice ceruſs four ounces, and of Armenian bole two ounces, both in fine powder; keep them in the fire, continually ſtirring, till they grow hard; then let all cool, break the pot, and put up the ſtone for uſe.

It faſtens teeth, preſerves the gums, heals and dries up ulcers and wounds, and is alſo uſed in injections and eye-waters.

The veſſel in which you make it, muſt be three or four times bigger than will contain the ingredients, by reaſon of the great ebullition which will ariſe from the mingling of the acid of vitriol and diſtilled vinegar, with the ſalt of tartar and calx of lead; but eſpecially when you put in the ceruſs, you muſt do it warily, and keep it down by continual ſtirring.

The Sympathetical Powder.

TAKE good *Engliſh* vitriol, ſuch as we call bow-copperas; purify it as before directed, by two or three diſſolutions, filtrations, and cryſtallizations; ſet thoſe cryſtals in a clean pan in the ſun, either of *June*, *July*, or *Auguſt*, ſo long till they are calcined to whiteneſs: when one ſide is calcined, turn the other, and in a few days the cryſtals will crumble into powder; if they do not, you may beat, and expoſe them again to the ſun, ſtirring them three or four times every day. At laſt beat them into very fine powder, and again ſet them in the ſun, ſtirring as before, for two or three days more, in which time they will be very white: then take in the matter while the ſun ſhines hot upon it, and keep it from the air in glaſſes well ſtopt, and in a dry place.

IT is a mild, but powerful ſtyptic, always ſucceſsfully applied in the ſtopping of blood, either at the noſe, or wounds; and, where there is no fracture of the bone, will heal.

YOU muſt ſo expoſe it to the ſun, that the rain may not fall upon it, leaſt it ſhould waſh it away. Some think it ſufficiently calcined in ſix or ſeven days, expoſing it only ſix or eight hours in a day:

but it has been obſerved, that it is better performed by giving it thirty or forty days ſun.

The Royal Styptic.

UPON four ounces of ſympathetic powder, infuſe half an ounce of good oil of vitriol; ſtir them well in a glaſs mortar, with a peſtle of the ſame, and let them ſtand twenty-four hours on warm ſand, in a wide mouthed glaſs: grind this mixture again with a little ſpirit of wine, and put it into a matraſs; pour upon it more ſpirit of wine, to make that already uſed, a pint. Lute it well, and let the mixture ſtand forty-eight hours in digeſtion, often ſhaking it; then let it ſtand to cool and ſettle, and decant the ſpirit of wine, which keep well ſtopt. Remove the cucurbit or matraſs, into a ſand-furnace; lute on its head and receiver, and drive over the helm, and what will riſe in the third degree alſo keep by itſelf: let all cool, and take out what is left at the bottom; powder it, and put it into a cucurbit; pour upon it diſtilled rain-water one pound; ſet it on warm ſand forty-eight hours, and ſhake it often; then let it ſettle, decant, and keep it for uſe.

THE impregnated ſpirit and water may be uſed apart, or mixed; and if you would add ſtrength to the mixture, you may put ſome of the acid ſpirit drawn off, after the ſpirit of wine was decanted: but if you would make the beſt ſtyptic powder, put equal parts of the impregnated ſpirit of wine and water, and evaporate to dryneſs. It is both a powerful ſtyptic, and one of the beſt vulneraries in the world.

I have known ſome direct the putting of diſtilled vinegar to the diſſolution of vitriol, to cauſe a precipitation; but I could never find ſo great a diſagreement between them, as to be capable to effect it. I fear ſuch have either wrote after others, or foiſted in their own conceits, without conſulting an elaboratory; and it has coſt me much time and money, to follow them to no purpoſe.

A Styptic Water with Mars and Vitriol.

DISSOLVE one pound of common *Roman* vitriol, and precipitate its oker with oil of tartar per deliquium; when it is ſettled, decant the liquor, and dry the powder in an earthen pan over a gentle fire. Take of this dried powder and filings of iron, of each four ounces; mix them well, and put them into a wide mouthed glaſs: pour upon them (by one ounce at a time) three ounces of ſpirit of nitre; then add two ounces of oil of vitriol, by half an ounce at a time. Stir them well, and gradually pour upon them ten ounces of ſpring water. Let all ſtand in a gentle heat forty-eight (ſtirring them every twelve) hours. When ſettled, pour off the clear liquor, which is a very good ſtyptic.

"CHAP. XIII.

Of BORAX.

BORAX, or tincal, is brought to us from the *Eaſt-Indies* in great maſſes, compoſed partly of large cryſtals, but chiefly of ſmaller ones, partly white, and partly green, joined as it were together by a greaſy yellow ſubſtance, intermingled with ſand, ſmall ſtones, and other impurities. Borax, expoſed to the fire, ſmokes and ſwells up, but ſoon ſubſides, and melts into a glaſſy kind of ſubſtance, ſomewhat more than half its former weight, which is nevertheleſs ſoluble in water. Continued long in fuſion, it corrodes the ſides of the crucible, and penetrates them; yet crucibles are ſaid to be defended from the action of glaſs of lead, by being glazed with it. Diſtilled, it yields near half its weight of an inſipid liquor. It proves an excellent flux to metals, and preſerves them from the immediate action of the fire. It makes gold a little paler; which may be prevented by mingling with it a little nitre, or ſal armoniac: it has this effect, in a very extraordinary manner, on prince's metal; melted with which it turns into a reddiſh glaſs, leaving the metal of a whitiſh colour, as if tin had been mingled with it. Melted with ſand, or calcined flints, it flows with them into a cryſtalline glaſs, which is ſaid to be ſomewhat harder than the common. It readily vitrifies with magneſia,

neſia, cobalt, and the calces of metals; and fits them for colouring glaſs. Mixed with the vitriolic, marine, or nitrous acid, it ſublimes into elegant flowers, of which it affords greater quantity with the firſt, than with the latter. It precipitates ſolutions made by acids, and turns ſyrup of violets green. Diſſolved in water, (of which it requires twelve times its weight) filtred, evaporated, and cryſtallized, it forms little tranſparent, colourleſs cryſtals: the refiners of this ſalt have a method of ſhooting it into larger cryſtals; but theſe differ in ſeveral reſpects from the rough tincal, and are not ſo proper for many purpoſes as the larger and purer cryſtals unrefined."

Preparations of Borax.

" *The ſedative Salt of* Homberg, *by Sublimation.*

PUT nine ounces of borax in powder into a wide necked glaſs retort: pour on this half an ounce of water; then add one ounce and a quarter of concentrated oil of vitriol. Put the retort in a reverberatory, and gradually increaſe the fire till the retort is white-hot. Near an ounce of water will come over; then a volatile ſalt will riſe along with the remainder of the moiſture, whence ſome part of the flowers will be diſſolved in this laſt phlegm, and paſs with it into the receiver. Moſt of the flowers ſtick in the neck, which, if not large, will be blocked up, and thoſe that riſe afterwards, melted into a glaſſy kind of ſubſtance. Take out the flowers with a feather, and ſeparate from the liquor the ſalt which is carried over with it. On the caput mortuum pour two ounces of freſh water, and continue the diſtillation; or the remainder of the ſalt may be extracted by ſolution, filtration, evaporation, and cryſtallization: a black earth remains."

" *Another Method.*

MIX two ounces of oil of vitriol with ſix ounces of warm water: diſſolve in this four ounces of powdered borax. Evaporate ſome part of the humidity; and put the remaining maſs into a glaſs body, to which adapt a head, and with a gentle heat drive over into the receiver the remaining moiſture. When the matter grows dry, gradually increaſe the fire, till flowers appear in the head: keep up this heat till no more ariſe. Repeat the ſublimation four times, or oftener, gently pouring the liquor at each time on the caput mortuum. You will have three quarters of an ounce of flowers. The caput mortuum being lixiviated, will afford, upon evaporation and cryſtallization, a ſal mirabile, which appears to contain a little borax; the cryſtals are more ſlender, melt more difficultly in the fire, and have leſs water in them than the common. The remaining liquor, on continuing the fire, coagulates into a ſaline granulated matter, which yields no ſedative ſalt, and melts more difficultly in the fire than the former ſalt.

THE flowers, according to Mr. *Geoffroy*, are almoſt inſipid to the taſte. They calm the heat of the blood in burning fevers, prevent or remove delirious ſymptoms, and allay ſpaſmodic affections, whether hypochondriacal or hyſterical, at leaſt for a time: in a word, this ſalt is an excellent anodyne. The doſe is from one to ten grains in any proper liquor [g]."

" *The ſedative Salt by Cryſtallization.*

DISSOLVE four ounces of borax in a ſufficient quantity of warm water; and add to the ſolution one ounce and a quarter of oil of vitriol. Evaporate the mixture for ſome time, and the ſedative ſalt will ſwim a top in thin plates; then check the evaporation, and the plates will grow larger. Move not the veſſel till the cryſtallization is completed, when they will fall to the bottom. Then decant the liquor; waſh the cryſtals two or three times in cold water, and dry them in a warm place."

CHAP. XIV.

Of SULPHUR, *or common Brimſtone.*

IT is brought to us from *Italy*, and ſome of the *Weſt-India* Iſlands, being generated of a fat reſinous ſubſtance, full of an acid vitriolic ſpirit, as appears by its ſpirit made with a glaſs veſſel, reſembling the ſhape of a bell, from which it takes the name of ſpirit of ſulphur per campanam; differing very little from that of vitriol.

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[g] *Mat. Med.* tom. I. p. 132.

We have it in three forms, *viz.* firſt, ſulphur vivum [h], which comes to us as it is dug out of the earth, and valued at the deareſt price of the three, for no other reaſon, but that it is leſs vendible than the other. Secondly, mineral rough brimſtone, which by melting, is ſeparated from a great deal of inſignificant earth, which the ſulphur contained. Thirdly, that caſt into ſmall rolls, commonly ſold by grocers and chandlers, which is ſaid to be mixed with roſin, or ſome other bituminous ſubſtance, and by experience found to be the worſt ſort for the making either flowers or oil. The rough mineral brimſtone is beſt, for the aforeſaid uſes, as having leſs earth than ſulphur vivum, and not being mixed with any heterogeneous particles [i].

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[h] What is uſually ſold in the ſhops under this name, is no other than the caput mortuum of rough ſulphur, which remains after the flowers are ſublimed from it.

[i] Sulphur, or brimſtone, is a yellow mineral ſubſtance, found either already formed in the bowels of the earth, or obtained from certain ores by a kind of diſtillation; or compoſed by art. Sulphur readily melts in a ſmall heat, and in cloſe veſſels totally ſublimes in flowers; in open veſſels, its fume turns into flame, and forms a ſuffocating vapour, a ſmall quantity of which ſaturates a large one of fixt alkaline ſalt, but catched by the common methods, proves an acid liquor, ſimilar to that obtained by diſtillation from vitriol. If this latter is added to the neutral ſalt

Preparations of Sulphur.

Flowers of Sulphur.

TO make this to any advantage, it muſt be ſublimed in an arched room, inſtead of a glaſs or earthen receiver, and one, two, or three hundred weight (according to the magnitude of the room) may be put in at a time. You muſt have a great thick iron pan, called a tampin, to put the ſulphur

ſalt abovementioned, a volatile ſpirit is extricated, ſmelling like burning brimſtone. Sulphur deflagrates with nitre, and forms a neutral ſalt, perfectly like one compoſed of the vitriolic acid, and a fixed alkaline ſalt. Mixed with a fixed alkali, it melts into a deep red maſs, which fuſed with metals, renders them all ſoluble in water. Sulphur and mercury are united, by ſimple triture, into a black powder, and by ſublimation into a beautiful red maſs. Thrown upon ſilver, copper, or iron, heated very hot, it liquefies them, and ſtrongly adheres to them. It retards the fuſion of tin, and converts it wholly into ſcoriæ; and with lead, compoſes a maſs ſcarcely fuſible in a great fire. Regulus of antimony, united with it over the fire, reaſſumes its priſtine form of crude antimony. Of all the metals, it is moſt ſtrongly abſorbed by iron; hence the uſe of iron in making regulus of antimony, and running down ores. Acid liquors have no effect upon it: quicklime and alkaline ſalts, both volatile and fixed, mingled with water, readily diſſolve it, but immediately part with it upon the affuſion of any acid. The volatile ſpirit which ariſes from brimſtone when ſet on fire, diſcharges colours, and prevents or checks fermentation. Mingled with water, it ſoon loſes its volatility, and becomes a ponderous acid, which does not exhale, unleſs in a conſiderable degree of heat. This acid readily unites with the inflammable part of bodies into ſulphur, in which form it loſes all its acrimony. If this ſulphur be ſet on fire, the acid recovers its volatility.

ſulphur in ; which muſt be placed immediately over the grate, and about a third part of the diameter of the tampin left open above its brim, to ſuffer the fumes to come into the arch, where they condenſe into flowers. The arch ought to be twenty-two, or at leaſt eighteen inches thick ; and that cramped together with iron, to reſiſt the force of the fumes.

If you deſign your furnace to ſublime one hundred weight of flowers at a time, your pan muſt be capable of holding one hundred and a quarter ; your arch five foot high, three foot broad, and five foot long ; and its inſide and floor ſet with glazed tiles. In the end, or ſide of the furnace, you muſt have a door, which muſt be two foot ſquare ; it muſt be ſtrongly barricadoed, and have a hole in it, of a quarter of an inch diameter, which muſt be exactly ſtopped with a plug, by which you may know when all is ſublimed. For when you think the operation is almoſt at an end, pull out the plug, and if the fume come not forcibly out, the operation is over ; but if you find a ſtrong fume, with ſome noiſe, continue the fire till all is over. Then let it cool twenty-four hours, before the door is opened ; and then go in, and with a wing, or clean bruſh, wipe the flowers into a heap, and take them out for uſe. It may be made in leſs quantity in veſſels of another form : a deſcription of both, you will ſee in the plates at the beginning of the book.

IT is a good pectoral medicine, and uſed in other phyſical preparations. Its doſe from ten grains to a ſcruple.

THE yellow rough mineral brimſtone, is beſt for this operation. For the firſt twelve or ſixteen hours, give a gentle fire, ſo much as to make the fumes riſe, but not to make the matter boil over.

The White Flowers of Sulphur.

TAKE of ſalt-petre, fixed with charcoal (as hereafter) half a pound, or but four ounces; of clean mineral ſulphur, twice its quantity; grind and mix them well together: then put them into a retort, and ſet it in a ſand-furnace: fit to it a receiver, but lute it not; make a gentle fire under it, which gradually increaſe to the third degree; and ſo keep it, till all the flowers riſe; which you will know by the upper part of the retort above the ſand being clear.

THE uſe and doſe is the ſame with the other; but ſome are of opinion, that theſe far exceed the other flowers in virtue.

YOU may make uſe of ſalt of tartar and nitre powdered, mixed and melted in a crucible, inſtead of fixed nitre, or ſalt of tartar; but you muſt not put into the crucible above a ſpoonful at a time, as you will ſee in the chapter of tartar.

The Milk of Sulphur.

TAKE clean ſalt of tartar, one pound; of flowers of ſulphur, ſix ounces, (ſome uſe but four ounces;) grind them well together in a ſtone mortar; then put them into a ſtrong earthen pan, and add of fountain water eight pounds: ſet this mixture over ſome live coals, and by degrees make it boil, till the liquor is very red, which will require three or four hours[k]: (as the water waſtes, ſupply it with new warm water.) Take it from the fire, and before it is quite cold, filtre it; then drop into it diſtilled vinegar, which will cauſe the red liquor to be muddy, and a white powder will precipitate. When the firſt precipitation is fallen, drop in more vinegar; and ſo proceed till you ſee the vinegar will not make the liquor muddy any more. After this, let all ſettle, and, by gentle inclination, pour off the liquor; put fountain water to the magiſtery; ſtir it well about, and let it ſettle: pour it off as before; and ſo proceed with ſix

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[k] This proceſs may be performed in a little time, and with greater eaſe than here directed, in the following manner.—— Take of pure dry fixt alkaline ſalt two parts, flowers of ſulphur one part: grind them well together in a ſtone mortar: put the mixture in a crucible, and ſhut it cloſely up with a proper cover: ſet it in a wind-furnace, and the matter will ſoon melt, when it is to be poured out into a hot dry veſſel. Powder this, and diſſolve it in boiling water; then precipitate the lac with ſpirit of ſalt, which is a cheaper acid than vinegar; free it from its ſalts by repeated affuſions of water, when it is fit for uſe.

ſix or eight lotions, till the powder is inſipid, and free from its urinous taſte.

ITS operation is the ſame as that of the flowers. Its doſe from one ſcruple to one dram.

YOU ought to make the precipitation in ſome place, where the noiſome ſcent has a good conveyance; either in a large chimney, or in the open air: for though it is not dangerous, yet it is very offenſive.

The Milk of Sulphur, with Quick Lime.

TAKE one part ſulphur, and two parts of quick lime; grind them well together; put them into an iron kettle, with ſix quarts of water to every three pounds of the mixture, and boil it till the liquor be as red as blood: ſtrain it (whilſt it is warm) into a veſſel, either of glaſs or earth, and let it ſtand to ſettle. What is not very clear, filtre; but if it be clear, decant it into a glaſs veſſel, and drop into it ſome warm urine, which will precipitate the diſſolution: waſh it as you did the former, and it anſwers to the ſame purpoſes.

Balſam of Sulphur, with Oil of Olives.

TAKE of the flowers of ſulphur, four ounces; ſallad oil, one pound; put them into a pipkin which will contain three times their quantity: ſet them over a fire, and make the matter to boil gently; keep it continually ſtirring with a wooden ſpatula, for the ſpace of an hour and a half, till it is quite cool, and put it up for uſe [l].

It is given in coughs, aſthmas, and wheeſings; phthiſics and conſumptions; and externally to heal and dry ulcers: it eaſes the pains of the gout. The doſe from ten to forty drops.

The veſſel ought not to be filled above one third, leſt it ſhould boil over, and take fire with violence, and put you in confuſion. Have alſo a fit cover to the veſſel ready, that you may ſmother it, if it ſhould take fire within the pipkin.

Balſam of Sulphur, with Oil of Turpentine.

TAKE four ounces of flowers of ſulphur, and one pound of oil of turpentine; place the mixture in a ſand-furnace; ſtop the matraſs looſly with another glaſs [m]; give a ſmall fire for one hour;

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[l] The directions of uſing a large veſſel, are here extremely neceſſary; for the moment the ſulphur and oil begin to act upon each other conſiderably, which is nearly at the point of ebullition, a very remarkable rarefaction enſues, eſpecially if the fire be at this time ever ſo little urged.

[m] This preparation is more conveniently and ſafely made in a very large and tall uncut glaſs body, without at all cloſing its orifice, from which great danger may enſue: for when the ſulphur and oil begin to act vehemently upon each other, they will not only rarify into a large volume, but, at this inſtant, great quantities of an elaſtic vapour are thrown out with the utmoſt impetuoſity, certainly burſting the veſſels to pieces, if they have not a free exit. *Hoffman* gives a very remarkable hiſtory of the effects of an accident of this kind. *Obſerv. Phyſico-chym.* lib. iii. obſ. 15.

hour; then increaſe it, till the oil boils gently, in which degree keep it three or four hours; then let it cool, and pour off the impregnated oil from that which is not diſſolved.

IT is a nauſeous, but an excellent medicine for the ulcers of the lungs. Its doſe from five to fifteen or twenty drops.

THE balſam of ſulphur, made with oil of aniſeed, is performed after the ſame manner, and is more grateful to the palate; alſo that with oil of amber, juniper, *&c.* [n]

IT ought to be made in a chimney, becauſe the ſteam, which comes from it, is as offenſive as that in the precipitation of ſulphur.

Balſam of Sulphur, with Oil of Linſeed.

PUT four ounces of linſeed oil into an earthen glazed body; ſet in a ſand heat, till it boil gently; then add one pound of flowers of ſulphur; ſtir it till it ſwells and ſubſides; then remove it from the fire, and when cold, pour upon it five pounds of tartarized ſpirit of wine: mix them well, and put them into a glaſs body, and by a gentle fire in a ſand-furnace, draw off the ſpirit of wine. When the balſam is cold, put it into a bottle for uſe. The uſe and doſe are the ſame with the other balſams of ſulphur; but this is moſt grateful.

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[n] The balſam of ſulphur with oil of aniſeed, or any other eſſential oil, is more ſafely and conveniently made, by putting in a glaſs veſſel, ſix ounces of the balſam of ſulphur with linſeed oil (the preparation of which is deſcribed in the following proceſs) to ſixteen ounces of the eſſential oil. Theſe may be made eaſily to incorporate, by ſetting the veſſel in warm ſand, and now and then ſhaking it. Balſams made after this manner are much more agreeable for medicinal purpoſes, than ſuch as are made after the common methods.

Balſam of the Sulphur of Mars.

TAKE the clean filings of iron, or broken needles; one pound; put them into a cucurbit, with ſpirit of ſalt five pounds; let it ſtand in a digeſtive heat five or ſix days; in which time the iron will be almoſt diſſolved: filtre and remove it into a glaſs retort; place it in the furnace with a great deal of ſand about it; give fire of the firſt degree for one hour, augment it to the ſecond, which continue till you cannot perceive any more drops to fall: Then change the receiver, and increaſe the fire to the third degree for one hour, and ſo paſs on to the extremity of the fourth, and keep it there four or five hours, in which time you will have red flowers aſcend into the neck of the retort, and ſome yellow ſpirit come into the receiver. Let all cool, and remove the veſſels. In the receiver you will have about four ounces of a yellow ſpirit: And (if you have proceeded regularly) about four ounces of foliated red flowers in the neck of the retort. Take of the flowers three ounces, of the yellow ſpirit one ounce; put them into a matraſs; infuſe upon them eight ounces of oil of turpentine;

let them digeſt upon warm ſand twenty-four hours; then augment the fire, ſo as to make the matter ſimmer for two hours: let all cool, and put it carefully from the feces for uſe.

I have heard it affirmed to be one of the beſt vulneraries in the world, and ſeen wonderful effects of it, both internally and externally. It is given in all diſtempers of the breaſt and lungs, the ſtone, and ulcers of the reins; and all other internal ulcers whatever. It alſo cicatrizes and heals external ulcers. Its doſe is from ten to fifty or ſixty drops.

THIS might have been placed with the martial preparations; but being a ſulphur, and of the nature of theſe medicines, I have given it here.

Liver of Sulphur.

TAKE flower of ſulphur, four ounces; pure ſalt of tartar, two ounces; mix and melt them in an earthen diſh; keep them ſtirring till they are as red as blood, without any white ſpecks. Take the mixture out of the diſh, and put it into a glaſs, and ſtop it cloſe°. Of this is made the tincture,

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° The proportion of the fixed alkaline ſalt to the ſulphur, is too little; it ſhould at leaſt be double the quantity of the Flowers. They are more conveniently united by fuſion in a cloſe crucible, than by ſtirring them in an open veſſel, over the fire, as here directed; for the latter occaſions the loſs of a conſiderable part of the ſulphur, which exhales in fume. If the ſtirring be continued any length of time, the ſulphur will be reſolved into its tincture, ſyrup, and vulnerary balſam, as followeth.

THIS operation ought to be performed in a chimney: you muſt keep it, after it is melted, continually ſtirring, till it is red as blood, and have a cover ready to ſtifle the flame if it ſhould take fire.

The Blood of Sulphur.

GRIND four ounces of liver of ſulphur, and two ounces of oil of tar, very well in a mortar, and pour upon them twelve ounces of ſweet ſpirit of nitre: ſhake the matraſs; then ſtop it cloſe, and let it digeſt ſeven or eight days; when cool, decant the liquor for uſe.

THE doſe from five to ſixty drops, mixed with a little ſyrup, and drank in canary, malaga, or ale. It is pectoral, carminative, and diuretic.

Tincture of Sulphur.

BEAT four ounces of the liver of ſulphur (while it is warm) in a warm mortar; put it preſently into a matraſs; put one pound of ſpirit of

its conſtituent parts, the inflammable flying away, and the acid only remaining; ſo that inſtead of a deep red coloured maſs, which eaſily melts in the fire, readily diſſolves in water, runs per deliquium in the air, diſſolves all the metals, and gives a notable tincture to ſpirit of wine; a white ſaline maſs, difficultly ſoluble in water, not eaſily melted in the fire, and which has no effect upon metals; in ſhort, which perfectly reſembles the ſalt formed of a mixture of a fixt alkali, and the vitriolic acid, is made.

of wine to it; ſet them in a digeſtion twenty-four hours, and you will have a very red tincture; which put up in a vial to be kept cloſe ſtopt for uſe.

IT is given in all diſtempers of the lungs, and ſaid to be a preſervative againſt contagious and peſtilential air. Its doſe from fifteen to twenty-five or thirty drops.

YOU ought to make the liver of ſulphur into fine powder, in a warm mortar, and put it into the matraſs as warm as poſſibly you can, before it attracts any air; then preſently put the ſpirit of wine to it, and fit a glaſs to the mouth of the cucurbit; lute the joint well, and ſet it to digeſt.

Another Tincture of Sulphur.

TAKE of philoſophical ſoap, (made with oil of turpentine and ſalt of tartar) four ounces; mix well with it, one ounce of balſam of ſulphur; put them into a matraſs, and pour upon them one pound and a half of tartarized ſpirit of wine; make a circulating veſſel of your matraſs, and let them digeſt twenty-four hours in a gentle heat; when cool, decant the tincture. This is eſteemed a more pectoral tincture than the other, though the doſe is the ſame.

“ *Volatile Tincture of Sulphur.*

TAKE of freſh calcined ſtone lime, three pounds; of flowers of ſulphur, one pound: ſlake the lime gradually, by ſprinkling ſome water upon it : when it is fallen into powder, grind it well with the ſulphur ; then add ſal armoniac in fine powder, two pounds ; grind the mixture well together by ſmall parcels at a time, and put the whole in a retort, which place in a ſand-furnace ; lute on a receiver with linſeed meal ; apply a gradual fire, till all, that will ariſe, is come over, which may be perceived by the receivers growing cool ; carefully pour out the liquor, avoiding the offenſive fume, into a bottle, to be kept well ſtopped.

This preparation might be made ſomewhat eaſier, by boiling the lime and ſulphur, in the quantities above directed, with two gallons of water, in an iron kettle, till ſuch time as a very deep red tincture is obtained ; when the liquor is to be decanted from the groſſer feces, kept till cool, and then poured upon the ſal armoniac, already placed in the diſtilling veſſel ; after which the proceſs may be performed as above.

The vapour of this liquor tinges, in an extraordinary manner, ſilver or copper utenſils, though placed at a conſiderable diſtance. If a piece of paper be wrote upon with a ſolution of ſaccharum ſaturni made in water, and then gently dried, the writing will diſappear : if this be placed in the middle of a quire of paper, or even of a pretty thick book, and brought near to the unſtopt orifice of the bottle containing this liquor, the fume will ſoon reach it, and in a little time make the writing ſufficiently black and legible. The celebrated *Hoffman* ſpeaks of a mixture compoſed of one part of the tincture, and three of ſpirit of wine, as an extraordinary medicine, both internally taken, and externally applied; thirty or forty drops, he ſays, is a moſt powerful diaphoretic; and that a medicine may be compoſed of it and camphor, which ſurpriſingly takes off the pain of the gout, by bathing the feet with it [p]. I have not made, nor heard of any trials being made, with this tincture, as a medicine; it may probably be a very powerful one, but certainly it is a very unpleaſant one. The author abovementioned ſays, that a beautiful red powder may be made from mercury, like the cinnabar of the ſhops, by ſhaking it in a bottle with ſome of this tincture, and digeſting it for a few days in warm ſand. I have frequently made this experiment, and always with ſucceſs, and frequently by agitation alone. Whether this is not applicable to real advantage, I leave to others to determine."

A vulnerary Balſam of Sulphur.

TAKE of hepar ſulphuris, four ounces; of aloes ſocotorine, one ounce and a half; and of myrrh, one ounce; all in fine powder: put them into an earthen pot, and pour upon them one pound of balſam of turpentine, with two drams of ſaffron; ſet them over a gentle fire in ſand, which increaſe by degrees, till the oil ſimmer, and the ingredients are diſſolved ; then let them cool, and ſtrain the balſam through flannel, into a glaſs, which keep for uſe. It is ſaid to be one of the beſt of balſams, for the cure of wounds and ulcers.

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[p] Obſervat. Phyſico-chym. p. 250.

THE pot in which you make this balſam ought not to be filled above a third part ; carefully ſtir it when it begins to heat, leſt it ſhould boil over, and take fire, which it is apt to do : have a cover, and wet cloths, ready againſt ſuch an accident.

Oil of Sulphur by the Bell.

IT is made of the yellow mineral ſulphur : there is required to this operation two wooden frames, one earthen diſh, with a hole in the middle ; a flat gally-pot, or an earthen porringer, to burn the ſulphur in ; a wide mouthed glaſs, for a receiver ; and the bell-glaſs.

SET one of the wooden frames upon two bricks, and put the diſh, with the hole in its middle, upon it, and the flat gally-pot in the middle of the diſh, with the bottom upwards ; upon which, ſet the porringer which contains the ſulphur. Support the ſecond wooden frame upon two bricks more, as you did the firſt, in which frame, a hole muſt be made, fit for the bell-glaſs to reſt in, ſo that the edges of the bell be clear of the wood. When the porringer (charged with ſulphur) is fitted, ſet the ſulphur on fire, with a red hot iron ;

when it is all melted, ſtir it with a clean tobacco-pipe, or iron wire, to make it burn clear: then cover it with the bell, and in three or four hours time you will perceive the oil to condenſe about the ſides of the bell, and drop into the diſh, and ſo into the receiver. When you perceive the ſulphur to burn dull, take off the bell, and ſtir about the ſulphur with an iron wire, as before: then ſet the glaſs again, and ſo proceed, till you have as much oil (or rather ſpirit of ſulphur) as you deſire.

ITS operation is diuretic, and it is mixed with juleps, to give them an agreeable acidity to qualify the heat in continued fevers: ſome aſcribe greater virtue to it, than is given to oil of vitriol; but I never could diſtinguiſh any difference more than that one is the vitriolic ſpirit of ſulphur, and the other the ſulphureous ſpirit of vitriol.

AFTER the ſulphur burns clear, and the bell ſet over it begins to work, it will burn and work well for five or ſix hours: when the flame begins to decreaſe, take off the bell, and place it upon an earthen diſh (which you muſt ſet by the frame for that purpoſe) put in more ſulphur, and when it is all on fire, ſtir it with a clean pipe, and put on the bell again; and ſo continue, till all the ſulphur you deſign for ſpirit, be burnt.

“ THE proceſs, as above directed, is exceeding tedious, which is chiefly owing to a defect in the apparatus. Mr. *Homberg* has contrived a better,

ter, which is recommended by *Boerhaave* : and in the abridgment of the *Medical Eſſays* of the ſociety at *Edinburgh*, (vol. i. p. 160.) a more convenient one than either is fully deſcribed, which we ſhall here inſert.

TAKE a large retort, with a round hole in its bottom of ſix inches diameter : ſuſpend this by the neck, in ſuch a manner, that you may eaſily come at the bottom : immediately under the hole, upon a glaſs mortar, place a concave glaſs plate, perforated in the middle, and upon the perforation invert a gally-pot, which is to ſupport a crucible containing three ounces of flowers of ſulphur. To the neck of the retort, which ſhould be pretty wide, adapt a large tubulated receiver, with its pipe placed uppermoſt. Light the ſulphur with a bit of charcoal, and put it juſt within the orifice at the bottom of the retort : when the ſulphur is conſumed, place the ſame quantity of new lighted ſulphur in another crucible ; and thus proceed, till as much of the acid is obtained, as is required.

IN this proceſs it is obſervable ;

1. That it is neceſſary to bedew the glaſſes with the ſteam of boiling water, before you ſet fire to the ſulphur.

2. THAT the operation ſucceeds beſt in calm, ſtill, wet weather, and in a damp place ; in dry weather, the defect of the moiſture of the air may be ſupplied by conveying the ſteam of boiling water to

the orifice in the bottom of the retort; afterwards, the liquor may be dephlegmated to any degree of ſtrength by evaporation.

3. THAT by the make and poſition of the glaſſes, the acid fumes are continually riſing into them; inſomuch, that they ſoon grow opaque with clouds, which in a ſhort time condenſe, and trickle down the ſides of the glaſſes in drops.

4. THAT the ſulphur has air enough to burn clearly; for want of which, the acid would be ſpoiled by a great quantity of fuliginous matter, which would be elevated, and ſtick to the ſides of the glaſſes.

A pound of flowers of ſulphur, which may be burned in ſeven or eight hours, will yield, upon the moſt moderate computation, ſeven drams, or an ounce of pure acid."

" *Volatile Spirit of Sulphur.*

TAKE three or four conical bags, made like *Hippocrates*'s ſleeve, of thick flannel: moiſten theſe with a ſtrong lixivium of fixt alkaline ſalt: then ſuſpend them one within another, ſo that they do not touch. Put a ſmall quantity of flowers of ſulphur in a little earthen pan, and light it with a red hot iron. When the ſulphur is burnt out, put in more: continue this till the bags are grown dry and ſtiff, then ſprinkle them all over with freſh lye, and burn ſome more ſulphur underneath them. By repeating this, the bags will ſoon become cruſted over with ſalt, moſt part of which will eaſily ſeparate from them, upon rubbing them together; the reſt may be boiled out with common water, and afterwards obtained from it by evaporation. Put ſome of this ſalt in a tubulated retort; place it in a ſand-furnace, and adapt and lute a receiver to it. Then, by degrees, pour through the tube as much oil of vitriol as will equal in weight the ſalt. Stop the aperture with luting, and diſtill the volatile ſpirit with a gentle fire. If the ſulphur is burnt in a ſlow, gentle manner, and the bags well adjuſted to receive the vapour, a very conſiderable quantity of volatile acid ſpirit may be obtained, not falling greatly ſhort of the whole weight of the ſulphur [q]."

" *Another Method of obtaining the Volatile Spirit of Sulphur.*

TAKE of freſh ſtrong quick-lime, and *Ruſſian* pot-aſhes, of each four pounds; of water, five gallons. Sprinkle as much of the water on the quick-lime, as will ſerve to ſlake it; then cover it with the pot-aſhes in powder: when the lime is fallen to powder, add the reſt of the water, and ſtir them well together: then ſet the mixture by to ſettle. When the lye is become fine, decant it into an iron pan, and add to it of rough ſulphur in powder, one pound. Boil them over the fire, till the ſul-

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[q] See *Stahlii Exper. obſervat. & animadverſ.* ccc. *numero*, paſſim.

ſulphur appears to be diſſolved: then evaporate the ſolution to dryneſs. Put the remainder into a tubulated retort, and gradually add to it one pound and a half of the higheſt rectified oil of vitriol: then proceed as directed in the foregoing proceſs [r]."

" *Gas Sulphuris.*

TAKE flowers of ſulphur, half a pound; bright filings of iron, a quarter of a pound. Grind them well together in an iron, or marble mortar; then put the mixture into a retort; pour upon it a quarter of a pound of oil of vitriol: lute a receiver to it, in which you have put three quarts of water; place the retort (which ſhould have a long neck) ſo that its extremity may juſt be within the ſurface of the water in the recipient. Apply a gradual heat, till nothing more will come over."

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[r] This method was lately publiſhed as an improvement upon that of Dr. *Stahl*, and the author ſays, he gained eight ounces and ſome drams of a very volatile ſpirit, from one pound of ſulphur. From another hepar ſulphuris, made from the ſame quantity of ſulphur without quick-lime, to which he had added two pounds of oil of vitriol, he got twelve ounces of ſpirit, but ingenuoſly obſerves, that it was neither ſo volatile, or heavy, as the former. This preparation is called a genuine volatile ſpirit of ſulphur, and the whole of it is ſuppoſed to ariſe from the ſulphur alone: but from the increaſe gained by the addition of a larger quantity of oil of vitriol, it is natural to ſuſpect, that the aqueous part of that acid contributed to this; and if the acid ſpirit, obtained by this means, from one pound of ſulphur, be ſaturated with fixt alkaline ſalt, and compared with the quantity of fixed alkaline ſalt that may be ſaturated by *Stahl*'s method from the ſame quantity of ſulphur, the latter will be found vaſtly greater, and conſequently his method ſuperior to this.

" *Another Method.*

MIX four ounces of oil of vitriol with three pints of water: powder four ounces of hepar ſulphuris; put it into a retort, and pour upon it the acidulated water: place the retort in a ſand-furnace, lute on the receiver with a paſte made of linſeed meal and water, and apply a ſmall fire till all is diſtilled."

Salt of Sulphur.

TAKE four ounces of ſal polychreſtum, (prepared as hereafter in the chapter of nitre;) powder it in a glaſs mortar, with a peſtle of the ſame: put it into a flat wide-mouthed glaſs, and put to it two ounces of ſpirit of ſulphur; ſtir them well together with a clean tobacco-pipe, and ſet them in a gentle heat of ſand to evaporate; you will have a pleaſant acid ſalt, which put up in a vial for uſe.

ITS operation is diuretic and cathartic. Its doſe from one ſcruple to one dram and a half, in broth, or any proper vehicle: I have known it given to five or ſix drams; and then it has procured four or five motions per inferiora, as moſt ſalts will.

THIS is not really the ſalt of ſulphur, but nitre fixed by ſulphur, and afterwards impregnated with its ſpirit.

CHAP. XV.

Of ARSENIC.

IT is a juicy, combuſtible, mineral ſubſtance, conſiſting of ſulphur and corroſive ſalts; of which there are three ſorts, *viz.* yellow arſenic, called orpiment; red arſenic, called ſandarach; and the white, properly called arſenic. It is made of the red, by mixing equal parts of ſandarach and common ſalt, and ſubliming them together.

IT is one of the moſt pernicious of poiſons, and ſo great an enemy to the balſam of life, that it produceth ſtrange ſymptoms, as convulſions, ſwoonings, gripes, vomitings, palpitation of the heart, intolerable heat and thirſt, with mortification of the part where it comes [s].

Preparations

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[s] Arſenic is a factitious ſubſtance, obtained from certain minerals, particularly cobalt. There are three ſorts of it in the ſhops, white, yellow, and red. The white is a ponderous, ſemi-tranſparent, vitreous ſubſtance, ſaid to be made by melting the flowers of cobalt, in a cloſe crucible. The yellow is obtained, by melting ten parts of the white, with one of common ſulphur; and the red by uſing two. Of theſe three, the latter only is ſomewhat inflammable, by reaſon of the large portion of ſulphur added in its compoſition. It appears to me probable, that the white arſenic, at leaſt the better kinds of it, is obtained by ſublimation: both the white and red will riſe in the common

Preparations of Arſenic.

To ſublime Arſenic.

THE common way is to mix equal parts of arſenic and ſalt decrepitated, in fine powder; put them into a matraſs, in a ſand-furnace, within

common ſubliming veſſels, and in the form they are uſually met with. Some writers have ranked this mineral among the ſulphurs, and ſome among the ſemi-metals: as to the firſt, it wants the eſſential characteriſtic of bodies belonging to that tribe, inflammability: as to the latter, the metallic parts got from it, were only accidentally in it, and are not to be looked upon as eſſential parts of it as arſenic: beſides, it is in great meaſure ſoluble in water, and, if ſufficiently purified, would probably be entirely ſo. Expoſed to the fire, in an open veſſel, it does not melt, but grows ſomewhat ſoft, and evaporates in a white fume; the ſmell of which by ſome is reſembled to that of garlic: this fume proves, in an eminent degree, poiſonous to animals. Iron cemented with arſenic, forms a white brittle regulus: copper acquires the ſame whiteneſs; and retains, in ſome meaſure, its malleability, if rightly managed: tin mixed with it, burns immediately to aſhes; and ſtrongly holds a conſiderable portion of the arſenic. Lead mixed with arſenic, boils up, and partly evaporates in a thick ſmoke: the remainder runs into a yellowiſh, very fuſible glaſs. Arſenic penetrates ſilver, deſtroys its malleability, and, if urged with a quick fire, carries away ſome of the metal. It has much the ſame effect upon gold. All the metals, in general, abſorb arſenic, but in different quantities, and one more readily than another: iron proves the readieſt and ſtrongeſt abſorbent; then follows copper, tin, lead, and ſilver. Common ſulphur readily unites with this mineral, and makes it fuſible, and of a red colour; and thus forms the red kinds of arſenic: theſe may be reſtored to their priſtine appearance by the addition of mercury, which retains the ſulphur from being elevated by the degree of heat which the arſenic ariſes in.

a chimney, ſtopping the mouth of the matraſs looſly with cotton or paper; make a gentle fire, which increaſe gradually to the third degree, and ſo keep it till all is ſublimed: ſix or ſeven hours time will be ſufficient to raiſe the mixture of half a pound each. This you may repeat as often as you think convenient, every ſublimation ſeparating the light flowers, and taking only the cryſtalline part. This ſublimation cleanſes it, but in my opinion makes it the more corroſive, by carrying up ſome of the ſharp ſpirit of ſalt with it [t].

LET all your operations be performed in a chimney, that the pernicious fumes may freely aſcend without prejudice to the operator; and when you grind the arſenic, muffle your mouth and noſtrils.

To ſublime Arſenic for phyſical uſe.

TAKE of the aforeſaid ſublimate, one pound; put it into a crucible; ſet it in a melting furnace, in ſuch a fire as will juſt keep it melting, where continue it for two hours, in which time a great deal of the moſt corroſive poiſonous part will be exhaled. Let it cool, and that which remains in the crucible make into powder, and grind it with equal its weight of fine filings of iron; ſet them in a ſand-furnace to ſublime, as you did before, obſerving the ſame degree of fire, and ſpace of time, proportionable to the quantity: repeat this operation twice more, every time ſeparating the light flowers, and then you have a ſublimed arſenic, pretty well freed from its corroſive poiſon, and fit for farther preparation. Some have ventured to give the infuſion of this arſenic inwardly, and ſay it is a great antidote againſt poiſon.

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[t] There are ſeveral additions propoſed to be mixed with arſenic, in order to purify it, to be met with in authors. *Kunckel*, and others, recommend the uſe of a fixt alkaline ſalt; but this ſurely muſt be highly improper, ſince it evidently deſtroys one of its eſſential qualities, its volatility, and may be ſo managed, as to produce a concrete of a quite different kind. Common ſalt is the leaſt liable to objection of any of the ſubſtances employed for this purpoſe, as it has a good deal of affinity with the arſenic itſelf. White arſenic may be more effectually ſeparated from any heterogeneous ſubſtances, by ſublimation alone, if managed in a wary and artiſt-like manner.

Its operation is emetic and cathartic. Its doſe from three to eight grains, infuſed in wine.

The filings of ſteel being an alkali, abſorb the corroſive ſalt of arſenic, and keep it from aſcending with its more ſulphureous part.

Diaphoretic Arſenic.

Take of the aforeſaid ſweet ſublimate of arſenic, four ounces: bring it into fine powder; put it into a retort, and add to it twelve ounces of ſpirit of nitre: ſet the retort in a ſand-furnace; and make a gentle fire, which increaſe gradually to the third degree, and ſo keep it till no drop falls from the noſe of the retort: let it cool, and take out and grind the arſenic again; put it into a new retort, and put to it twelve ounces more of freſh ſpirit of nitre: proceed, as you did before, to the third degree of fire; and when you perceive no drop to ſall from the noſe of the retort, increaſe the fire to the fourth degree, and ſo keep it for two hours; then let all cool; take out the medicine, which make into a very ſubtile powder; put this into a matraſs; put to it tartarized ſpirit of wine half a pound; invert a fit glaſs into the mouth of the matraſs; lute well, and let it ſtand upon warm ſand twenty four hours, often ſhaking it about: take it from the ſand, let it ſettle, and decant the clear ſpirit of wine; put to the medicine half a pound more of freſh ſpirit of wine; let it ſtand as before, twenty-four hours; then let it cool, and when ſettled, decant it; dry the powder gently, and keep for uſe.

ITS operation is diaphoretic. Its doſe from five to twenty-five or thirty grains. I remember it to have been oftentimes uſed with good ſucceſs in the plague, in the year 1665.

PUT not above four ounces of ſpirit of nitre at a time upon the arſenic, and diſpoſe the mouth of the retort ſo that the fumes may beſt go up the chimney; when the fumes are well waſted, put on four ounces more of nitre, and do ſo the third time[u].

Regulus

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[u] This cannot, with any degree of propriety, be called a preparation of arſenic. Upon diligently attending to the circumſtances of the proceſs, it ſhould appear rather to be a crocus of iron.

Regulus of Arſenic.

TAKE arſenic, eight ounces; ſalt of tartar, made of tartar and nitre, ana ſix ounces; filings of ſteel, four ounces; charcoal-duſt, one ounce: beat and mix them, and by a ſpoonful at a time, put them into a red-hot crucible: when it is in, make a fire all over it, and let the matter ſtand in good fuſion half an hour, then take it out, and pour it into a warm greaſed cone, or mortar, knocking it about the ſides to make the regulus ſettle: you may purify it as that of antimony.

THERE is alſo a regulus of arſenic, made of arſenic one pound, pot-aſhes ſix ounces, and ſoft ſoap one pound; mix, and put them into a crucible, covered with another that has a hole in it, and ſo bring the matter to fuſion gradually in a melting furnace.

WHEN it is melted, and fit to take out of the fire, let the cone or mortar be placed in the chimney, ſo that you may keep from the fumes it emits.

Spirit and Butter of Arſenic.

TAKE arſenic, half a pound; mercury ſublimate, one pound: mix them well, and put them into a retort; place it in a ſand-furnace; lute on its receiver, and give it gradual fire, as in the butter of antimony, and you will have a thin fuming ſpirit, and a butter. When all is cold, take off the receiver; pour the ſpirit into a glaſs well ſtopped: the butter you muſt keep by itſelf.

The ſpirit, ſome ſay, will radically diſſolve iron: the butter is a great cauſtic.

If you put on a new receiver, after you have taken off the ſpirit and butter of arſenic, urge the fire ſtrongly, and the crude mercury will diſtill in drops, which ſerves for any uſe that other quickſilver can be put to: there is no need of putting water into the recipient; the mercury will condenſe without it. And if you deſire more diſſolving ſpirit, put the butter and ſpirit into a new retort, and diſtill them again: and by repeating this operation, you will make (almoſt) all the butter into ſpirit. When the butter is all raiſed, you may melt it down out of the neck of the retort into the receiver, by holding a kindled charcoal under it, as you do in the butter of antimony; then take off the receiver, put on another, and diſtill the running mercury.

Arſenical Magnet.

Take of cryſtalline arſenic, yellow ſulphur, and crude antimony, of each three ounces; theſe all being made into ſubtile powder, and mixed, put them into a retort; fit a receiver without luting, and give it gradual fire to the third degree, where keep it three hours; augment the fire to the fourth, for an hour more; then let all cool, and in the bottom of the retort you will find a pellucid maſs, of a dark red colour.

In the time of the plague, 1665, I made this magnet, and it was much uſed both in plaiſters and amulets.

Some order it to be done in an earthen veſſel, and kept ſtirring till it is well mixed; and whilſt ſoft, to form it into amulets: but to do it in a retort is more ſafe from the noxiouſneſs of the fumes, and renders the magnet as uſeful.

A ponderous Oil of Arſenic.

TAKE arſenic, and corroſive ſublimate of mercury, of each one pound; powder and mix them well, and put them into a retort; and place it in a ſand-furnace: keep it one hour in the firſt degree of heat, two hours in the ſecond, three in the third, and four hours (or till no fumes aſcend) in the fourth. When cold, you will find in the receiver a ſublimate, a ſpirit, and a ponderous black oil, which will not mix with the ſpirit. Rectify them in a clean retort, and the oil and ſpirit will come clear, but not incorporate. Return the ſpirit and oil upon the red maſs remaining in the firſt retort, and diſtill them again in ſand, and you will have a much more ponderous oil than the former.

For this proceſs I have received the thanks of a great pretender to alchymy, with an account of what wonders he could work with it.

To fix Arſenic.

POWDER and mix one pound of pure white arſenic, and two pounds of nitre; put them into a retort, and pour upon them two pounds of oil of vitriol: place the retort in a ſand-furnace; fit to it a large receiver, and for the three firſt hours give it a gentle heat; then increaſe the fire till the red fumes are near ſpent. Laſtly, let it ſtand in the fourth degree of heat, till neither fumes nor drops appear. When it is cold, you will find a milk-white maſs (well fixed) in the bottom of the retort. If you would have it more fixed, powder it, and return it into a retort with the ſpirit of nitre you drew off, and one pound of rectified oil of vitriol; place it in a ſand-furnace, and give gradual fire till no fumes appear in the receiver: and this operation you may repeat at diſcretion.

I know not whether this preparation be uſeful in phyſic; but if the arſenical calx be waſhed from the ſalts by the ponderous oil (in the former proceſs) I am ſure it may be made fuſible, and truly fixed. If you cohobate the ſpirit three or four times upon the arſenic, it will ſtand a very great heat in the naked fire.

"CHAP. XVI.

Of ORPIMENT.

AURIPIGMENTUM, orpiment, is a mineral ſubſtance, compoſed of ſmall ſcales, or leaves, like talc, eaſily ſeparable from one another: It is ſaid to be found in the mines of gold, ſilver, and copper. It is of three different colours, of a bright, ſhining, golden colour, a vermilion red, intermixed with a deep yellow, and a green, with a whitiſh yellow: this laſt ſort is the moſt impure, being mixed with earthy ſubſtances, and ſometimes with a kind of white talky clay.

AURIPIGMENTUM, expoſed to the fire in an open veſſel, melts, and emits a flame, not ſo blue as that of brimſtone, but intermingled with a copious white fume, ſmelling ſomewhat like that of arſenic. As ſoon as it is melted, it appears of a deep red colour; and, when poured out into a thin plate, and cold, does not ill reſemble, in colour and tranſparency, a garnet. Kept in the fire for ſome time, it evaporates: the purer ſorts ſcarce leave any perceptible feces. Sublimed in a glaſs veſſel, ſome whitiſh flowers firſt ariſe, which are ſoon followed by others of a deep yellow, inclining to an orange colour; and at length by red flowers, which, not riſing ſo high as the others, are melted, by the nearneſs of the fire, into a tranſparent red ſubſtance, like that abovementioned. *Geoffroy* relates, that the taſte of auripigmentum is acrimonious: but it did not appear ſo to me upon trial; and *Hoffman* ſays expreſly, it has no taſte. The fumes, which ariſe from it laſt, whiten copper, and make it brittle. Oils, and fixed alkaline ſalts, diſſolve it. Mixed with nitre and ſalt of tartar, it makes gunpowder. Mixed with nitre, and injected into a red hot crucible, it deflagrates, and goes partly off in white fumes; the reſt remains in a white maſs, which cemented with copper, makes it white and brittle.

Preparations of Orpiment.

Ponderous ſmoaking Liquor from Orpiment.

TAKE of mercury ſublimate, one pound; of orpiment, half a pound: grind them well together; put the mixture into a wide necked retort, and let it ſtand unſtopped in a cellar for a day and a night. Then lute on a large receiver, and give at firſt a very ſoft fire, which gradually increaſe: a large quantity of a very ponderous clear liquor will come over, which continually ſmokes: another will follow, which will ſwim upon the top of the former, and not mingle with it, however diligently they are ſhook together. Upon increaſing the fire, a good deal of cinnabar will ariſe, and at the bottom remain a little light, friable, yellow, caput mortuum.

A Regulus of Auripigmentum by Sublimation.

MIX equal quantities of auripigmentum in powder, and ſoap, perfectly well together: put the mixture into a retort, and place it in capella vacua: at firſt apply a ſmall degree of heat; upon increaſing the fire, a whitiſh, ſulphureous, oily liquor will come over; then ſome ſulphur will ſublime into the neck of the retort, partly black from the empyreumatic oil of the ſoap; part will have a yellow and red appearance. Increaſe the fire to the utmoſt, and a ſhining regulus will ſublime like to that which ariſes from arſenic when treated in the ſame manner. In the caput mortuum, which will be light, and of a blackiſh colour, will remain a ſmall portion of ſulphur, and ſome earthy and alkaline parts of the ſoap."

CHAP. XVII.

Of SALT-PETRE.

IT is a ſalt, though extracted out of the earth, yet abundantly impregnated with the ſpirit of the air. It alſo cleaves to ſtone walls, rocks, clefts, and caverns under ground. That which is extracted out of fat earth, is made in moſt countries of *Europe*; but our greateſt quantities come from the *Eaſt-Indies*. It is compoſed of near an equal quantity of fixed and volatile nitrous aerial ſalts, bitteriſh in taſte: it is the product of the elements, de-

depoſited in the boſom of the earth, for the generation and nouriſhment of vegetables, and may not be improperly called, the univerſal and unſpecific mercury [w].

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[w] Nitre is a neutral ſalt, extracted from certain earths by the means of water. It may be artificially obtained from vegetable and animal matters, by rotting them together, and expoſing them for a long time to the action of the air; without the acceſs of which, nitre is never generated: hence the ſoils from which it is obtained, lie on the ſurface of the earth. The quantity of ſalt is ſaid to be increaſed in theſe ſubſtances, by mingling them with the aſhes of vegetables, or moiſtening them with urine. Nitre, expoſed to the fire in clean veſſels, eaſily melts, without undergoing any conſiderable alteration. Expoſed to a great heat, it either flies away in fume, or tranſudes through the veſſel: if any little part remains, it is found changed into a ſharp alkali. If a coal, or any other inflammable matter, be thrown upon it, whilſt in fuſion, it detonates with a bright flame, and conſiderable noiſe: after the detonation is over, a large quantity of alkaline ſalt is found remaining. Cold water diſſolves pure nitre ſlowly; but by agitation may be made to take up ſomewhat more than one ſixth of its own weight, and, by heating it till it boils, a great deal more. A ſaturated ſolution of it, ſet to cryſtallize, ſhoots into colourleſs tranſparent cryſtals, in appearance not unlike natural ſprig-cryſtal: their figure is that of an hexagonal priſm, terminated by a pyramid of an equal number of ſides. If the vitriolic acid, or ſubſtances containing it, be mixed along with nitre, and both expoſed to the fire, a red vapour ariſes, which being catched, proves a ponderous, yellow, acid liquor: this being poured upon fixed alkaline ſalts, effervеſces with them, and at length is changed into a neutral ſalt, exactly reſembling the nitre from which it was firſt extracted. The acid of nitre, poured upon ſea ſalt, attacks its earthy parts, and, upon evapo-

ration,

Purification of Salt-Petre.

TAKE what quantity you pleaſe of nitre; diſſolve it in [x] warm water; filtre, evaporate, and cryſtallize, as you do other ſalts. This is an operation not abſolutely neceſſary amongſt us; our refiners of ſalt-petre giving it well purified to our hands. Some eſteem the cryſtalline nitre beſt; others, the lump: but I could never obſerve any difference in them; the one being the top, and the lump the bottom of the pan, in which the nitrous liquor was put to ſhoot.

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ration, reaſſumes with it the priſtine appearance of nitre. This acid, conſidered as a menſtruum, diſſolves all the metals, (but one more readily than another) gold alone excepted, which it likewiſe readily acts upon, when joined with a little marine ſalt: poured upon abſorbent earths, it effervеſces with them, and converts them into a ſeemingly homogeneous liquor: it has the ſame effect on animal ſubſtances; but acts not at all on flints, cryſtal, and ſuch like matters. This acid cloſely adheres to metallic ſubſtances, ſo as not to be ſeparable from them without a great fire: but it ſtill more ſtrongly adheres to abſorbent earths; from which, perhaps, fire alone cannot ſeparate it. If, after it has diſſolved any inflammable ſubſtances, the ſolution be evaporated, a violent detonation will ariſe. Nitre added, in ſubſtance, to gold and ſilver, promotes their fuſion; but deflagrates with the reſt of the metals, and turns them into calces, and is itſelf converted into an alkaline ſalt. Projected with common ſulphur into a red hot crucible, it flames vividly, and concretes with it into a neutral ſalt difficultly ſoluble in water, and which reſembles one compoſed of the vitriolic acid, and a pure fixed alkaline ſalt.

[x] Somewhat more than ſix times its weight of boiling water is ſufficient.

" *Another Method of purifying Nitre.*

DISSOLVE nitre in ſeven times its quantity of boiling lime-water (made of one pound of quick-lime, and two gallons of water). Paſs this through a ſtrainer, while boiling hot; and ſlowly evaporate the clear ſolution, in a ſhallow broad veſſel, till a pellicle begins to appear upon its ſurface. Then cover the veſſel with a cloth, ſet it aſide in a place where it may not cool too faſt, and large and beautiful cryſtals will ſoon form themſelves to the ſides of the veſſel, which are to be put in a ſieve or drainer, and ſet in a warm place, till the liquor is drained from them, and they are become dry. Exhale the remaining liquor, and ſet it to cryſtallize as before, till no more cryſtals will ſhoot from it. If you would have a nitre perfectly pure and free from common ſalt, diſſolve the cryſtals which ſhoot after the firſt evaporation, in ſix times their weight of pure boiling water: as ſoon as the ſalt is diſſolved, ſet the ſolution by to cryſtallize, with the ſame cautions as before. Theſe cryſtals will be perfectly pure, and fit for the fineſt purpoſes.

EVAPORATE the liquor which remains after the cryſtallization of nitre, to a dry ſubſtance, which calcine for ſome time in a crucible; the powder that remains is called magneſia alba; a dram or two of which proves a good purge in hypochondriacal caſes. This medicine was kept as a great ſecret, under the name of Count *de Palmer*'s powder, till *Hoffman* communicated it *, who likewiſe obſerves, that a ſalt, very ſimilar to this, may be obtained from the caput mortuum of ſpirit of ſal armoniac made with quick lime."

Cryſtal Mineral.

MELT what quantity you pleaſe of ſalt-petre in an earthen pot, or very clean iron kettle; when it is well melted, caſt a little flower of ſulphur upon it; when that is burnt, put on more, and ſo do, till the nitre flows clear as rock water, without any ſcum: then with a clean iron or braſs ladle, take it out of the pot, and put it into a warm braſs pan, or mould. When that is coagulated, put it by, and with the ladle take out more; and ſo do, till all the melted ſalt is caſt, which keep for uſe. It is alſo called ſal prunellæ [y]. If you deſire it yet more pure, diſſolve it in clean warm water;

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* Obſervat. Phyſico-chym. lib. ii. obſ. 12.

[y] This preparation is not equal, for medicinal purpoſes, to refined ſalt-petre in cryſtals. The addition of ſulphur is really injurious, converting the nitre, as far as ſo little a quantity can do, into a ſalt of quite another nature. See the following preparation. The notion that nitre was purified by this preparation, has occaſioned an abuſe that is not to be honeſtly paſſed over in ſilence, which is the admixture of other cheaper ſalts along with the nitre, whilſt in fuſion. This may be eaſily detected by pounding it, and boiling it in little more than ſix times its weight of water, and then paſſing it, when almoſt cold, through a ſtrainer, when a conſiderable portion will remain behind, which, thrown upon burning fuel, will not deflagrate.

ter; filtre the diſſolution, and evaporate, till a thin ſkin appear upon its ſurface; then ſet it to cryſtallize. This is called cryſtal mineral, or ſal prunellæ cryſtalliſatum.

ITS operation is diuretic and cooling: it is given in fevers, quinſeys, gonorrhæas, and in peſtilential diſeaſes. Its doſe from ten grains to one ſcruple, or half a dram; and ſo on to an ounce.

IT differs not much from pure nitre; the burning of ſulphur upon it, conſumes the accidental dirt, which may have fallen into it, and evaporates a little of its humidity and ſpirit: but whether this makes the medicine more or leſs effectual, the phyſician is the beſt judge.

Sal Polychreſtum.

MIX equal parts of ſulphur and nitre in fine powder, and put them into a red hot crucible by a ſpoonful at a time; as ſoon as the flame of one ſpoonful is conſumed, put in another; and ſo continue, till all your mixture is in: put a tile over the top, cover it all over with coals, and keep it in fuſion four or five hours, and then pour it into a warm copper veſſel, and when cold, powder and diſſolve it in warm water: filtre the diſſolution, and evaporate till it is dry. If the ſalt be not ſo white as you deſire it, put it into a crucible, and ſet it in a ſtrong fire three or four hours longer, continually ſtirring it, till it is very white: then again diſſolve, filtre, and coagulate, and you will have a pure ſal polychreſtum [z].

Its operation is cathartic and diuretic. Its doſe is from half a dram to one ounce.

If to ſix ounces of ſal polychreſtum, you put one ounce of ſublimed ſal armoniac, and of ſal mirabile Glauberi, and then diſſolve, filtre, and cryſtallize them together; the compoſition will be much more agreeable, and better deſerve the name of polychreſtum, than before.

This ought to be made of pure nitre; becauſe what is impure, or of the nature of common ſalt, fixes with the medicine in its preparation, which ſome (with good reaſon) think not to anſwer the intent of the medicine.

The purging Salt of Nitre.

PUT one pound of nitre into a crucible; ſet it in a wind-furnace; give it a gradual fire, till it melts; then put into it a live charcoal, about a quarter of an inch diameter; when it has done flaming, put in another, and ſo continue to do, till the coal cauſeth no flame: this is called fixed nitre. Pour this into a warm mortar; beat it to powder, and diſſolve it in diſtilled vinegar; filtre, and evaporate in a wide-mouthed glaſs: diſſolve it again in freſh diſtilled vinegar; filtre and coagulate the third time; then diſſolve it in high rectified ſpirit of

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[z] This preparation differs but little, if at all, from ſal enixum, which ſee.

of wine; which diſtill from it, and you will have a ſalt, eaſy of fuſion, pleaſant in taſte and operation.

IT is cathartic and diuretic, and opens obſtructions in all the chief bowels. Its doſe is from two ſcruples to four or five drams. The fixed nitre being expoſed to the air, diſſolves into an oil of nitre per deliquium.

YOU ought to diſſolve the fixt nitre ſo often in vinegar, till it comes off as ſharp in its diſtillation from the nitre, as it was when put to it.

" *A fixed alkaline Salt from Nitre and Tartar.*

POWDER and mix equal parts of nitre and tartar together. Project theſe, by a ſpoonful at a time, into a red hot iron pot: cover the pot, after each projection, with a plate or tile: a violent detonation will ariſe; and a copious fume, with a particular ſmell, be diſperſed all about; after the deflagration is over, a white maſs, with a bluiſh caſt, will remain; which being diſſolved in water, filtred, and evaporated to dryneſs, in a clean iron kettle, will yield a very white and ſtrong fixed alkaline ſalt, ſomewhat leſs than the weight of the ſalt-petre employed, ſufficiently pure, and fit for many purpoſes.

ALL the nitre does not ſeem to be entirely changed in this proceſs; for, upon affuſing a little of the vitriolic acid upon ſome of the ſalt, a vapour ariſes, ſmelling like ſpirit of nitre."

Spirit of Nitre.

TAKE one pound of nitre in fine powder, and four pounds of clean tobacco-pipes, or fuller's-earth, alſo beaten to fine powder; mix them well, and put them into a good earthen or coated glaſs retort; place it in an open furnace; lute a receiver, and kindle a fire under it; which keep in the firſt degree, till you ſee ſome reddiſh fumes appear in the recipient; neither augment the heat, till thoſe fumes diſappear: then increaſe the fire to the ſecond, which will raiſe more red fumes; when they begin to decreaſe, raiſe it to the third, and ſo on to the fourth, and moſt extreme degree of fire, till no more clouds come over; then let out the fire, and as ſoon as the veſſels are cool enough, take off the receiver, and put the ſpirit into a glaſs, with a glaſs or wax ſtopple.

ITS chief uſe is to diſſolve minerals, which it performs as well, and ſome think better than aqua fortis. But it is alſo a noble diuretic: the doſe from ten to fifty drops.

THE nitre, for this operation, ought to be pure and dry; for if it be not ſeparated from the common ſalt, which is in all our unrefined nitre, it will produce an aqua regia. If it be not dry, it cannot be made into ſuch fine powder as is requiſite to keep it from melting together, by which the emiſſion of its ſpirit would be hindred [a].

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[a] This proceſs is conſtructed upon a wrong principle: for how-

Spirit of Nitre, with Oil of Vitriol, and the Sal Enixum of Paracelſus.

PUT one pound of ſalt-petre into a glaſs retort, and pour upon it, one pound of oil of vitriol, and twelve ounces of ſpring water; mix them, and avoid the fumes; then place the mixture on a ſand-furnace: lute on a receiver, and give a fire of the firſt degree, two hours; advance to the ſecond, where keep it two hours longer, and ſo on to the third and fourth, giving two hours to each degree; in which time the operation will be ended. When all is cold, take off the receiver, and put the ſpirit in a vial to be ſtopped with wax, or a glaſs ſtopple. This ſpirit anſwers all the ends of the former [b]. In the retort you will find a white maſs, of a pleaſant acid taſte.

ITS

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however powerfully you divide the integrant parts of nitre, by fuller's-earth, tobacco-pipes, or ſuch like ſubſtances, no more ſpirit will ariſe in any degree of heat whatſoever, than the vitriolic acid contained in ſuch ſubſtances is capable of extricating; and as it is in an exceeding ſmall quantity in the things above named, they are very improper intermediums. Several longnecks were charged with a mixture of nitre and fuller's-earth, exquiſitely ground together, and placed in a reverberatory furnace. After the fire had been applied for three days, no ſpirit was perceived in the receivers: the bottoms of ſuch of the longnecks as were neareſt the fire, were vitrified by the intenſeneſs of the heat.

[b] For ſeveral purpoſes, the ſpirit of nitre as prepared above, is ſufficiently ſtrong. If the fire be continued as long, and the de-

Its operation is diuretic, and a powerful opener of obſtructions. Its doſe is from one ſcruple to one dram, in water-gruel, broth, or water.

This ſpirit is made with leſs trouble than the former; and to anſwer the charge of the oil of vitriol, you have the ſalt, which ſome have obſerved to be endued with all the virtues of tartarum vitriolatum.

" *Another Method of diſtilling Nitre.*

Take of the pureſt nitre, as much as you pleaſe: put it in a clean ladle, or kettle, over a clear fire: as ſoon as it is perfectly melted, pour it out into an iron mortar, or other convenient veſſel: when it is cold, break the ſalt into ſmall pieces. Chooſe a retort free from blebs, ſmall ſtones, and other inequalities in the glaſs: let the ſides of its bole be as ſtreight (not bulging) as poſſible; its neck not too converging, but wide and long, and not bent ſo much as they moſt commonly are. Into this, put as much of the dried nitre

degree of heat be as intenſe as a good ſand-furnace is capable of giving, a conſiderable quantity of the vitriolic acid, which here bears too large a proportion to the ſalt, will come over after the nitrous ſpirit, and render it unfit for the diſſolution of ſilver, the making ſpiritus nitri dulcis, and ſuch other preparations as require the pure acid of nitre. It may indeed, by drawing it over again from ſome more well dryed nitre, be perfectly cleanſed from the vitriolic taint, and made ſomewhat ſtronger: but this is an unthrifty way of management; therefore a more convenient proceſs is ſubjoined.

nitre as may fill the body of the retort to about one third its height, computing from the bottom to the lowermoſt ſide of the neck: place the retort upon a little ſand, in an iron pot, of ſuch a ſize, that its neck may go juſt clear over the rim, and its body not touch the ſides. Fit on a tubulated receiver, with two pipes, (ſee plate II.) ſo that the neck of the retort may come a little way into its body: let its lowermoſt pipe paſs through a hole in a ſtand made for this purpoſe, (ſee plate II.) into a bottle placed underneath, to receive the condenſed vapour: to the uppermoſt pipe of the recipient an additional tube, of three feet in length, is to be occaſionally luted [c].

WHEN this apparatus is all adjuſted, remove the ſtand, with the two recipients; and lifting up the neck of the retort a ſmall matter, convey into it, by the means of a crooked glaſs pipe, (ſee plate II.) one third the weight of the nitre, of ſtrong oil of vitriol: then turning the pipe, (ſo that the crooked end, which was lowermoſt, may be uppermoſt) withdraw it; and immediately join the recipient to the retort with a proper lute, and the additional tube to the uppermoſt pipe with the ſame: the pipe which goes into the bottle may be luted with bees-wax, a little ſoftened by heat. Make a very ſmall fire under the pot: red fumes will ariſe in great abundance, and fill the recipient, which will grow ſenſibly warm: gently increaſe the heat, and manage the fire ſo that little or no vapour may be perceived to paſs out at the top of the uppermoſt tube. Continue the diſtillation till ſuch time as the recipient grows cool, and no drops fall from the retort."

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[c] Its office is to give free exit to the incoercible vapour, which ariſes in moſt diſtillations. By this means the luting is preſerved entire, and the operation may be finiſhed in leſs time, as well as with greater ſafety, than when the common inſtruments are made uſe of.

The ſweet Spirit of Nitre.

PUT into a retort, half a pound of ſpirit of wine tartarized; to which add four ounces of ſpirit of nitre, by half an ounce at a time[d]: a crackling will enſue upon the mixture; and when that is over, put in more, and ſo proceed, till all is in. Then ſhake them well together, and place the retort in a ſand-furnace; fit a receiver, not luted, or but ſlightly; make a fire of the firſt degree; proceed from thence to the ſecond; where keep it one hour and a half; and then, one hour more of the third will finiſh the operation[e].

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[d] Take care that you do not invert the order of this proceſs, and put the ſpirit of wine to the ſpirit of nitre; for, if you ſhould, a violent effervescence will ariſe, and the whole matter be inſtantly diſperſed in poiſonous fumes. See *Boerh. Elem. chem. proc.* 135. *Hoffman. obſervat. phyſico-chym.* lib. ii. obſ. 4. *Pharmacop. Reform.* edit. 2. p. 61, 304.

[e] This proceſs may be more ſafely performed, if a tubulated receiver, with its additional pipe, was made uſe of; the junctures of which may be luted without any danger. The above proportion of the

IT is diaphoretic and diuretic; alſo a great expeller of wind, and opener of obſtructions. Its doſe is from ten drops to two hundred.

Single Aqua Fortis.

TAKE of crude vitriol, three pounds; of nitre, two pounds; beat and mix them well; put the mixture into an earthen pot, called a long-neck; place it in an open fire; fit to it a receiver, which lute well with clay, ſand, and cut flax, wrought together; give a fire of the firſt degree for three hours; in that time you will ſee ſome red fumes in the receiver, which will again diſappear: then raiſe the fire to the ſecond degree; where keep it three hours longer: go on to the third and fourth; where keep it, till the receiver is free from fumes. When all is cold, take the receiver off carefully, and keep the aqua fortis for uſe. It is uſed chiefly by dyers, refiners, and varniſh-makers; and is alſo a good menſtruum to be uſed in the preparation of other medicines.

FOR this operation you need not take the trouble of making the nitre ſo fine, as in the ſpirit of

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the vinous ſpirit to the acid, is too ſmall; ſix parts of the former ſhould at leaſt be added to one of the latter. It is pretty difficult to determine the time in which the diſtillation ſhould be diſcontinued: but if the diſtilling-veſſel be placed in a water-bath, this point may be eaſily ſettled; for as much may be drawn over as that heat is capable of elevating.

of nitre; the crude vitriol and nitre are ſufficiently mixed, by melting together in the retort[f].

Double Aqua Fortis.

TAKE of vitriol, calcined almoſt to redneſs, four pounds; of nitre, two pounds, both made into fine powder, and well mixed; put the mixture into an earthen long-neck, or glaſs retort ſet it in a reverberatory furnace; fit and lute on a receiver to it; kindle the fire, and proceed as in the ſingle aqua fortis. Some mix clay with the calcined vitriol and nitre; but it is altogether unneceſſary: and if you deſire its caput mortuum waſhed, it is inconvenient. The nitre ought to be finely powdered, the better to mix the calcined vitriol and nitre, before they are put into the retort, for the reaſon recited in the ſpirit of nitre.

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[f] An iron pot, with an earthen head, is more convenient for this purpoſe than long-necks, and is the inſtrument uſually employed by the makers of aqua-fortis. The common aqua fortis is ſo foul and impure, as not to be fit for the nicer purpoſes: hence frequent miſcarriages ariſe in ſundry branches of buſineſs, particularly in the dying of ſcarlet, and in preparing certain pigments for the colourmen. Dr. *Merret* (in his notes upon *Neri*'s *art of glaſs)* relates, that the refiners prefer *Dantzick* vitriol for making their parting water; and that if they uſe our common vitriol, it will infallibly make their verditer (which ſhould be of a ſky-blue) of a dirty green colour. The extreme fire, uſually employed in drawing aqua fortis, generally carries over ſome of the metallic parts of the vitriol, along with the aqua fortis: the above named author mentions an experiment, which we have not tried, as a proof of this; that if a knife be held over a veſſel of boiling aqua fortis, which has been drawn with *Hungarian* vitriol and nitre, it will ſoon acquire a perfect copper colour. If the common aqua fortis be carefully rectified, a conſiderable quantity of foul black matter will remain at the bottom of the diſtilling veſſel, which appears to be chiefly iron. But metallic matters are not the only ones which may make aqua fortis unfit for ſome purpoſes: it frequently contains ſome of the vitriolic acid, and moſt commonly, a good deal of the marine. A careful rectification from a little freſh nitre, will ſeparate it from the firſt of theſe ſubſtances; and it may be perfectly cleanſed from the latter by a ſaturated ſolution of ſilver. See page 25.

IN the rectification of theſe, and other acid ſpirits, the phlegm comes firſt; whereas in all vinous and urinous ſpirits, it comes laſt.

Tincture of Salt-petre.

TAKE of nitre, fixed with charcoal, as directed in the purging ſalt of nitre, one pound; put it into a crucible, and give it a ſtrong melting heat, for three or four hours: then put it into a warm mortar; powder it, and whilſt warm, pour upon it half a pound of tartarized ſpirit of wine: ſet the mixture in a matraſs, upon ſand, gradually increaſing the fire, till the ſpirit of wine ſimmers, and ſo continue it two or three hours; in which time, the fixed nitre will have communicated its tincture to the ſpirit of wine: decant, and put on more, and digeſt ſo long as it yields any tincture [g].

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[g] The long continued fuſion here ordered is quite unneceſſary, and anſwers no manner of purpoſe. It is ſufficient only to calcine

Its operation is diaphoretic and diuretic. It purifies the blood, and is a great anti-ſcorbutic. Its doſe is from twenty drops to a dram.

You may put the firſt and ſecond tinctures together in a retort, and draw off ſo much ſpirit of wine, as is neceſſary to leave the remaining ſpirit of wine well charged with the tincture.

A pleaſant purging Salt.

Take one pound of ſalt-petre; grind it well with half a pound of flowers of brimſtone; put it by ſpoonfuls into a hot crucible: when it has ſtood melted a quarter of an hour, pour it gradually into a large pan of hot water: then add oil of vitriol, and pulverized ſal armoniac, of each four ounces; boil the mixture up to a ſalt, which beat into powder, and keep for uſe. The doſe from one to three drams[h].

Fulminating

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cine the ſalt till it is perfectly dry: if a ſpirit be poured upon this, which has previouſly received the leaſt tinge from any vegetable matters, as from ſtanding ſome time in a caſk, it will ſoon acquire a red colour, and fully anſwer whatever can be rationally expected from it when prepared after the more elaborate method above mentioned.

[h] Pulverize twelve ounces of the caput mortuum of ſpirit of nitre made with oil of vitriol: mix this with four ounces of ſal mirabile in powder: then diſſolve the whole in as much boiling water as is ſufficient; and evaporate to a dry ſalt. This will very nearly reſemble the above ſalt, both as to appearance and virtue.

Fulminating Powder.

IT is compoſed of nitre, three parts; ſalt of tartar, two parts; and ſulphur, one part: mix them diligently, and keep the powder dry for uſe.

ITS operation is diaphoretic and diuretic. Its doſe is from ten grains to one dram.

IF you put one dram of this powder into a ſpoon, fire-ſhovel, or on the point of a knife, and hold it over a gentle fire half a quarter of an hour, it will then begin to melt, and give a report like a muſquet.

LET the nitre, ſalt of tartar, and ſulphur, be all very dry, and grind them in a warm mortar with a warm peſtle: for if you let them attract air, it leſſens the crack.

CHAP. XVIII.

Of Common SALT.

COMMON ſalt is the quinteſſential part of ſalt water, *viz.* of the ſea, or of fountains, which remains after a full evaporation of the inſipid humidity of the ſaid marine or fountain water. Of it there are three ſorts, *viz.* ſal gem, ſo called from its tranſparency, and ſimilitude of precious ſtones; that made by evaporation of the water of ſalt fountains, and of ſea water. The ſal gem we have from the north-eaſt countries, as *Poland*, &c. where there are large rocks of it; the fountain ſalt out of *Cheſhire* and *Worceſterſhire*; and that of the ſea from all parts of the world near the ſea: and of it there are two ſorts, that made by evaporation with fuel, and that dried by the ſun, the laſt of which is the ſtrongeſt. The ſal gem is the moſt penetrating, as appears by its diſſolving and volatilizing gold, more powerfully than the other [i].

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[i] The three kinds of common ſalt, though of different origin, have a near affinity to each other, and when reduced to the greateſt degree of purity, do not ſenſibly differ from one another. Common ſalt is of a ſnowy whiteneſs; it eaſily melts in water, of which it requires about three times its own weight: its ſolution, ſlowly evaporated, yields cubical cryſtals, which unite together in the form of hollow truncated pyramids. Expoſed to the fire, it crackles and flies about, but ſoon after melts, when it appears as fluid as water. Kept in an extreme heat for a long time, ſome part of it flies away in fume, and the remainder acquires ſomething of an alkaline nature. This ſalt, when decrepitated, or melted, readily runs per deliquium into an unctuous liquor, and at the ſame time depoſites a conſiderable quantity of earth: if this liquor be inſpiſſated, and run per deliquium again, it depoſites more earthy feces, and upon repeating theſe operations, loſes entirely its ſaline qualities: but if well cryſtallized, it is not eaſily affected by the moiſture of the air. Thrown on burning coals, it ariſes in the form of a white fume. Mixed with metalline matters, it proves a powerful flux; but if continued long in the fire with them, deſtroys ſome of the metallic parts. It promotes the calcination of lead, copper, and tin, and concretes with the two latter. Antimony, melted with ſalt, is corroded by it, bubbles, ſmokes, and depoſites but little regulus. Sulphur, mixed with ſalt, deflagrates in the fire, with a bright flame; but the ſalt receives no

Purification of Salt.

IT is ſeparated from its earth, and accidental dirt, by diſſolution, filtration, and cryſtallization.

" *Cryſtallization*

no alteration from this; nor is a hepar ſulphuris formed; but the ſulphur entirely exhales. Common ſalt, mingled with the vitriolic, or nitrous acid, and expoſed to the fire, partly riſes in a copious white vapour, which being condenſed, proves a highly acid liquor, that ferments with fixed alkaline ſalt, and, when fully ſaturated with it, and properly treated, ſhoots into cubical cryſtals in appearance and in ſeveral other reſpects ſimilar to the ſalt from which the ſpirit was at firſt obtained, but proving more acrimonious, more fuſible in the fire, and more fixed therein: the part which remains with the vitriolic acid, proves ſoluble in equal its weight of water, and ſhoots into long cryſtals, of various figures, which are not at all acid, neither do they decrepitate in the fire, or run per deliquium, or give any marks of the ſalt from which they were obtained: the part which remains with the nitrous acid, concretes into a ſalt reſembling common nitre, except in the form of its cryſtals, which incline more to thoſe of common ſalt; this ſalt deflagrates with any inflammable ſubſtance, and, with the vitriolic acid, yields a ſpirit, reſembling that of nitre in every reſpect: what change the remainder has undergone, I have not tried; but it appears to be a matter highly worth enquiring into. The acid of ſea-ſalt, conſidered as a menſtruum, acts powerfully upon earthy ſubſtances, and diſſolves zinc, iron, copper, tin, biſmuth, and when highly concentrated, mercury and regulus of antimony, and in ſome circumſtances, ſilver and lead. It is remarkable of this acid, that it does not part with ſuch ſubſtances as it has diſſolved, in the ſame manner as the acid of nitre does: thus it is not ſeparable from mercury or ſilver by fire alone;

“ *Cryſtallization of Salt.*

DISSOLVE of bay-ſalt, in ſix times its weight of ſoft water made hot, as much as you pleaſe. Let the ſolution ſtand till cold: then paſs it gently through a fine ſtrainer, till it is perfectly clear and colourleſs. Evaporate the liquor in a flat iron pan, with a continued equable heat, ſo as to raiſe a ſteam, but not to make the liquor bubble or boil: when a ſaline cruſt begins to form itſelf upon the ſurface, cover the veſſel with a cloth, and remove it into a warm place: the ſalt will form itſelf into large tranſparent cubical grains, be perfectly pure, and fit for the fineſt purpoſes.

lone; but riſes with the firſt in a ſaline form, and volatiliſes the latter. The acid of ſea-ſalt, poured on quick-lime, ferments with it, and forms a ſaline ſubſtance, very eaſily fuſible in the fire, and which expoſed to the air, runs per deliquium: from this compound, mixed with freſh lime, *Vigani* promiſes that a perpetual ſmoaking ſpirit may be diſtilled: *Le Mort* gives the ſame proceſs; but it did not ſucceed with me in ſeveral careful trials. This acid requires a ſtronger fire to diſtill it, than that of nitre; neverthelеſs, it is more eaſily diſſipated by the action of the air. Kept in bottles with glaſs ſtoppers, a ſaline eſſloreſcence appears, in time, round the mouth and ſtopper: ſome have ſaid, that it penetrates the glaſs; but this does not appear probable.

Decrepitation of Salt.

PUT what quantity of common ſalt you pleaſe into a crucible, (or any other earthen veſſel which will endure the fire) give it ſuch a heat as will make it crackle, but not melt; continue it in that degree of fire (now and then ſtirring it with an iron hook) till it cracks no more: and this you may do either before, or after purification.

Spirit of Salt.

TAKE of common ſalt, one pound and a half; of burnt tobacco-pipes, or fuller's-earth, four pounds and a half; let the ſalt and bole be well dried, and beaten into very fine powder; then mix them exactly, and put them into an earthen or glaſs retort luted, which ought not to be quite two thirds full: place the veſſel in a reverberatory furnace, cover it with its dome, fit and lute on a receiver; make under it a fire of the firſt degree, and continue it about two hours, in which time the lute will be dry: then increaſe the fire to the ſecond degree, and continue it three hours, and ſo proceed to the third, andthere keep it four hours; urge it further to the fourth, for five hours longer; in which time (the fire being exactly managed) the operation will be ended, which you will perceive by the diſappearance of the white clouds in the receiver; let it cool, and take off the ſpirit [k].

Put the ſpirit into a clean cucurbit, or retort; place it in ſand, in a gentle heat, fit a receiver not luted; give it gentle fire, to raiſe the inſipid phlegm: when you perceive the drops to have an acid taſte, put away that which is in the receiver, which put on again, and lute; keep it in a fire of the ſecond degree, till there is a minute's ſpace of time between the falling of each drop. Then take off the ſpirit, and keep for uſe. It is more grateful in taſte than it was before its rectification. In the retort will be left the heavy ſpirit of ſalt, which is improperly called its oil; which may alſo be rectified, and rendered more grateful, by increaſing the fire to the third and fourth degree, till nothing is left in the retort, but a ſtyptic yellow earth.

Its operation is diuretic, and it is uſed in any vehicle, to make it of a pleaſant acidity. It is given in fevers, obſtructions of the liver and ſpleen, dropſies, jaundice, and to quench thirſt. It doſe is from ten to ſixty or ſeventy drops.

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[k] This proceſs is liable to more objections than the ſpirit of nitre with tobacco-pipes, fullers-earth, or the like ſubſtances; for ſalt diſpoſes theſe ſubſtances to vitrify, and its acid ſpirit ſo ſtrongly adheres to the metallic matters contained in them, as either in diſtillation to bring them over with itſelf, or to remain fixed along with them. The quantity of the vitriolic acid, which is the only part here uſeful, is ſo ſmall in theſe ſubſtances, that it is neceſſary to uſe triple the weight here ordered, to have a ſufficient effect.

YOU may put one part of crude tobacco-pipe clay, to two parts of bole, and work it well with the bole or clay moiſt; make it into little pellets, which dry, and then diſtill, as you are directed.

Spirit of Sal, made with Oil of Vitriol, &c.

TAKE of clean common ſalt, and fountain water, ana two pounds; of oil of vitriol the ſame quantity[1]; and mix them thus: Firſt, put the water into an earthen veſſel; then put the oil to it, by two or three ounces at a time; if you put in more, it will endanger breaking the veſſel by its violent heat. Then put the ſalt into a glaſs retort, and put the oil and water to it; ſet the retort in a ſand furnace, fit a receiver to it, and make a fire of the firſt degree for one hour; then advance to the ſecond, where keep it three hours; increaſe to the third, four hours; and ſo to the fourth, till no more fumes, or drops, come into the receiver. This ſpirit, without any rectification, is more grateful than the former, and equal to, if not exceeding it in virtue.

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[1] One pound of oil of vitriol is enough for two of the ſalt. *Boerhaave* ſets down the ingredients in a different proportion: three parts of ſalt are ordered to two parts of water, and one of the vitriolic acid: theſe are well adjuſted to one another. A very volatile fuming ſpirit of ſalt may be obtained by the proceſs ſet down for making ſpirit of nitre, in page 201, only ſubſtituting ſea-ſalt inſtead of nitre; a ſpirit ſimilar to which is improperly called the gummy ſmoaking oil of tin; ſee page 40.

“ *Aqua Regis.*

TAKE one pound of common ſalt: melt it in a clean crucible, or iron ladle: pour it out into an iron mortar; and when cold, break it into little bits of the ſize of peaſe. Put theſe into a retort; and pour upon them twice their weight of good aqua fortis. Set the retort in a ſand-furnace; lute on a recipient; and apply a gradual fire, till no more liquor drops from the noſe of the retort.

An aqua regia may likewiſe be made, by mixing one part of ſpirit of ſalt, with three of aqua fortis; or by diſſolving the ſame quantity of ſal armoniac in it: but this ſhould be done ſlowly, and by degrees; otherwiſe great quantity of offenſive fumes will ariſe [m].”

Sal Mirabile.

TAKE the ſalt left in the retort after the diſtillation of the aforeſaid ſpirit of ſalt: diſſolve and filtre it, evaporate part of the water, and ſet the other in a cold place to cryſtallize. In cold weather, it will ſhoot in forty-eight hours, and in warm weather, in three or four days.

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[m] Aqua regis diſſolves iron, copper, tin, gold, mercury, regulus of antimony, biſmuth, and zinc. It likewiſe makes an imperfect ſolution of lead: but acts not at all upon ſilver.

ITS operation is cathartic and diuretic, and it anſwers all the uſes of moſt of the purging waters. Its doſe from half an ounce to an ounce, in a pint or a quart of purging or ſpring water.

IF the retort perform the operation without cracking, you may put water to the ſalt which is in it, and diſſolve and filtre, and ſo ſave the retort. The evaporation may be made in a clean iron kettle, or an earthen one.

Spirit of Sal Gem.

SPIRIT of ſal gem is made in every reſpect as that of common ſalt, either with bole, or oil of vitriol. Its uſe and virtues are the ſame as that of common ſalt, but it is a more powerful diſſolvent of gold.

" CHAP. XIX.

Of ALUM.

ALUM is a ſalt of a white, or pale red colour, and a ſweet ſtyptic taſte. Being diſſolved in water, of which it requires about twelve times its own weight, duly evaporated, and ſet to ſhoot, it forms ſemi-tranſparent, octogonal cryſtals; four of the ſides have hexagonal, and the other four triangular ſurfaces. Alum, expoſed to the fire, eaſily melts, bubbles up in bliſters, and emits a copious phlegm, and then turns into a light, ſpongy, white maſs; which, being urged with a great fire, yields (but in very little quantity) an acid ſpirit,

rit, like that obtained from vitriol or ſulphur: maſs, which remains behind, is partly ſoluble in water, and, after due evaporation, reaſſumes the appearance of alum. The baſis of alum appears to be a kind of lime-ſtone, or calcarious earth.

Alum is produced from a bituminous mineral ſubſtance, which eaſily ſplits like ſlate; or from a ſoft bituminous glebe, which being laid in heaps, grows hot, and burſts out into flame, which if not moderated, or prevented, leaves only an inſipid earth behind it. There are ſeveral other ſubſtances which yield alum: moſt of them require to be previouſly calcined, in order to produce it. The *Swedes* obtain alum, vitriol, and ſulphur, from one and the ſame ſtone: it is an elegant kind of pyrites, heavy, exceeding hard, and of a bright golden colour, variegated with ſilver-coloured ſpots: this ſtone is heated in the fire; and then cold water thrown on it; upon which, it breaks into pieces: from theſe, ſulphur is diſtilled: what remains in the veſſels is expoſed to the air for two years; the matter ſoon grows warm, and emits a copious fume, with a ſmall and ſcarce perceptible flame: a ſky-coloured calx remains, from which a vitriol is obtained by the common methods: when the liquor will no longer cryſtallize, a mixture of urine and fixed alkaline ſalt is added; upon which a copious red ſediment precipitates, and the remaining clear liquor being duly evaporated, affords alum.

SOLUTION of alum coagulates milk, changes the blue colour of ſyrup of violets into a purple, makes no alteration in ſolution of ſublimate, and turns an infuſion of galls turbid and whitiſh: oil of tartar mixed with it, precipitates a white earthy ſubſtance, which is not fuſible in the common furnaces, nor ſoluble in water; and uniting with the acid parts of the alum, is changed into a ſalt like that which reſults from a due mixture of an alkaline ſalt with the vitriolic acid: *Hoffman* ſays, that there is a difference between theſe two; that the ſalt prepared from alum is a more effectual purgative, and that upon powdering it in a mortar, it threw out little ſparkles of fire [n]. Oftentimes an urinous ſmell ariſes upon the mixture of alum with alkaline ſalts: this is ſaid to be owing to urine employed in the preparation of alum; and that this never happens, when *Roman* alum [o] is employed. The earthy part of alum readily imbibes, and ſtrongly retains the colouring parts of vegetables: hence it is of great uſe to the colourmen and the dyer."

Preparations of Alum.

" *The black Phoſphorus of Mr.* Homberg.

TAKE four ounces of alum in powder, and one ounce of any kind of vegetable meal or flower: mix them together, and put the mixture in an iron pan over the fire, the matter will ſoon become liquid: keep continually ſtirring it, till ſuch time as it appears perfectly dry, when it is to be taken out, and reduced to a very fine powder, and afterwards gently calcined, till it is reduced to a dark brown or blackiſh colour. Put this powder into a ſmall bolt-head, or a long vial (ſuch as are uſually filled with *Hungary* water:) ſet this in a crucible, and pour ſand all round it, ſo as that it may not touch the ſides: place the crucible in an open fire, which gradually increaſe till the bottom of the crucible is red hot: in this ſtate keep it for a quarter of an hour, when the vial being firſt ſtopt, the crucible containing it is to be removed from the fire, and the whole ſuffered to grow cool by degrees; after which the vial may be ſafely taken out of the ſand, and, as uſually directed, kept in a dark place; for the rays of the ſun are ſaid to deſtroy its property of growing red hot upon being expoſed to the air.

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[n] *Obſerv. Phyſico-chym.* lib. iii. obſ. 8.

[o] See the method of making *Roman* alum in *Geoffr. Mat. Med.* tom. I. p. 135.

THIS powder has not hitherto been applied to any other purpoſes that I know of, than that of mere amuſement. A little of it being poured out on paper ſoon ſmoaks, grows red hot on its ſurface, and at length appears as an ignited coal. But this phænomenon greatly varies according as ſome circumſtances determine it; thus it ſooner ſucceeds in a very moiſt, than in a dry air; and ſooner on paper which is ſomewhat moiſtened, than on ſuch as is perfectly dry.

THIS phoſphorus appears to be a real lime, mixed with a true ſulphur, and a portion of a rarified vegetable coal. Alum is by ſome writers ſuppoſed to be the only ſalt in nature capable of producing this effect: but I have accidentally obtained, in diſtilling of wax from quick-lime, a powder which produced the ſame effects; this has ſucceeded more than once, when quick-lime and wax have been mixed together with this particular view."

CHAP. XX.

Of AMBER.

IT is ſuppoſed to be a bituminous juice and reſin of the earth, ſoft and viſcous, for in it we often find flies, ants, *&c.* It is called amber, ſuccinum, carabe, and gleſſum. It is found in the *Perſian* gulph, or on the *Italian* ſhore; alſo in the currents near the *Baltic* ſea, in the dutchy of *Pruſſia.* It is of different colours, *viz.* white, yellow, and black: but thoſe who work it into beads, and other things, make a diſtinction of twenty or thirty ſorts.

THE white is moſt eſteemed for phyſical uſe, as being beſt digeſted, and of the moſt odoriferous ſmell, containing the greateſt quantity of volatile ſalt. The yellow is next in goodneſs, and moſt valued by the amber-workers, by reaſon of its tranſparency. The black is leaſt in eſteem. Amber, by agitation, ſends forth an agreeable ſmell, and being ground into fine powder, is given in gonorrhæa's, ſpitting of blood, the bloody-flux, and the immoderate flux of the hæmorrhoids, terms, *&c.* Alſo to ſtop the violence of catarrhs, if the fume of it be received up the noſe.

IT is found in pieces of different ſizes, from the bigneſs of a great pin's head, to thoſe of five, ſix, ſeven inches diameter; the greater pieces are wrought into cabinets, cups, and ſeveral figures, and are valued according to their bigneſs and tranſparency.

THAT we meet withal in the ſhops, is by the druggiſts generally diſpoſed into two ſorts, by ſeparating the white and yellow pieces, from thoſe that are full of ſcurf and black, which they diſtinguiſh by the names of fine and coarſe amber: the fine levigated is for phyſical uſe, and the coarſe for diſtillation [p].

Preparations

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[p] Amber is a bituminous ſubſtance, dug out of the earth, or found upon the ſea-ſhores. It is of various colours, and in different degrees of purity and perfection: the white is generally eſteemed as the beſt for chemical purpoſes, and the brown as the worſt. The ſpecific gravity of amber, according to *Muſſchenbroek,* is to that of water as 1,065 to 1,000. Fine amber rubbed briſkly on a woollen cloth, emits a peculiar ſtrong ſmell, which to moſt people is very agreeable. Boiled in water, it neither ſoftens, or undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs, very like

Preparations of Amber.

“ *Solution of Amber.*

TAKE of the cauſtic ſalt of regulus of antimony [q] and of amber, each half a pound. Reduce

like a bitumen. Set on fire, its ſmell greatly reſembles that which ariſes from the finer kinds of pit-coal. Amber diſtilled in a retort, with a well graduated fire, yields firſt a phlegm, which is lightly acid, intermingled with a copious, thin, limpid oil, which grows thicker, and deeper-coloured, as the fire is increaſed: at length, a white ſaline matter ariſes, and fixes itſelf to the neck of the retort; which is ſucceeded by a groſſer oil, and, in a great heat, by a black, thick, pitchy matter: there remains at the bottom of the diſtilling veſſel, little or no feces, if the amber be pure. The oil very much reſembles petroleum, and proves not ſoluble in ſpirit of wine, unleſs it be artfully ſeparated from its groſſer parts. Salt of amber readily diſſolves in water, and in a proper quantity of it, ſhoots into an irregular lump of cryſtals: If it is expoſed to a ſmall heat in a glaſs veſſel, it firſt melts, and then riſes in a white fume, and ſticks to the upper part of the glaſs in white flakes: this ſalt efferveſces with alkaline liquors; but makes no ſenſible commotion with acid ones. Amber is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but expreſt ones are not brought to act upon it without great difficulty: the ſtronger kinds of fixed alkaline lixiviums almoſt totally diſſolve it. Ground with a very pure fixed alkaline ſalt, and then ſet to digeſt with ſpirit of wine, for a long time, a great number of large tranſparent cryſtals, of a cubical figure, were found at the bottom of the glaſs; ſome of which decrepitated over the fire, with a much ſmarter noiſe than common ſalt is uſed to do: this ſalt, diſſolved in water, filtred and cryſtallized, appeared of a bright ſnowy whiteneſs; its taſte was like that of common ſalt, attended with a peculiar kind of bitterneſs;

Reduce them to powder, and grind them well together in a marble mortar: put the mixture in a glaſs body, or bolt-head; and pour upon it two quarts of water. Set the glaſs in a ſand-furnace; and apply a gradual fire, till the mixture (which is to be ſhaken every now and then) begins to boil gently: keep up this degree of heat, till the amber appears to be diſſolved.

Hoffman ſpeaks of this ſolution as a powerful medicine in removing infarctions of the viſcera, and promoting excretions of all kinds, and therefore of great ſervice in chronic caſes."

Oil, Volatile Salt, and Spirit of Amber.

TAKE of coarſe amber, in fine powder, one pound; of tobacco-pipes, bricks, ſand, or other bole, alſo in fine powder, three pounds: mix them

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neſs: expoſed to a naked fire in a bolt-head, and gradually heated red hot, it decrepitated, and gave out a ſmall quantity of vapour, which appeared aqueous; the ſalt did not melt, or appear any way altered: upon pouring oil of vitriol on this ſalt, a white vapour aroſe, with a ſmall effervеſcence. The mixture being ſet over the fire, the ſalt ſoon diſſolved with a hiſſing noiſe, and white fumes aroſe in great abundance.

[q] The cauſtic ſalt of regulus of antimony is made thus.—— Take equal parts of nitre and regulus of antimony. Grind them together, and inject them into an ignited crucible: let them ſtand in an intenſe degree of heat, for an hour or more. When the matter is grown cool, powder it, and boil it in a conſiderable quantity of fair water; then filtre, and evaporate to dryneſs.

them well, and with the mixture fill a retort half full; ſet it in a ſand-furnace, fit to it a receiver, (not luted;) make a fire of the firſt degree for one hour; increaſe it to the ſecond, and ſo keep it two hours, and then to the third; in which keep it four hours. In the firſt degree, ſome of the acid water we call ſpirit, with a little of the fineſt oil, will diſtill. In the ſecond, the ſpirit and oil will continue dropping, and ſome of its volatile ſalt will riſe into the neck of the retort. In the third, you will elevate more ſalt with the balſamic oil; and if you will urge the fire to the fourth degree, it will raiſe its thick balſam. As the ſalt riſes into the neck of the retort, you ought to ſcrape it out with a clean flat ſtick, and put it upon brown paper, to ſuck up the oil: the ſalt, by this means, will be white, and if you deſire it more fine, you may diſſolve, filtre, and evaporate it, and you will have a very white ſalt [r].

WHEN the diſtillation is over, and all cool, ſeparate the oil and ſpirit, by a funnel, or other ſeparating glaſs. If you would rectify the oil, you may put it into a long-bodied retort, and ſet it in ſand, and by gradually raiſing the fire to the ſecond degree, there will diſtill a fine yellow and clear oil: but if you would have a pure white and ethereal oil, you muſt put it into a cucurbit, with three times the quantity of water to that of oil, (with which the veſſel muſt not be quite half full;) and then fit on the head and receiver, and gradually bring up the fire to the ſecond degree, or ſo as to make the oil and water bubble, and you will diſtill a pure ethereal oil, which muſt be ſeparated as before. Separate the water from the oil left in the retort, and you will find it impregnated with ſome of the ſalt; and therefore put it into the receiver, into which you made the firſt diſtillation, and ſhake it well, to rince out the ſalt. Then pour all into a cucurbit; fit to it a head and receiver; give a gentle fire to evaporate the water, till the drops fall a little acid: then let it cool, and put it to the ſpirit which you ſeparated in the firſt diſtillation; rectify them together, and you have the ſpirit of amber.

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[r] From one hundred and ſix pounds of coarſe amber, were obtained upwards of thirty ounces of well purified ſalt. *Lemery* obtained half an ounce of ſalt from two pounds of amber.

THE operation of the oils, ſpirit, and ſalt, is diaphoretic and diuretic. The doſe of the rectified oils is from one to twelve or fifteen drops; of the unrectified oil, from one to ſix or ſeven drops. The doſe of the ſpirit, is from ten drops to one dram; and that of the ſalt, from two grains to one ſcruple. The rectified oil is given in hyſterical diſtempers, in the palſy, apoplexy, and epilepſy: the ſalt and ſpirit are given in the ſtone, and gravel in the kidneys and bladder, ſtoppage of urine, ulcers in the neck of the bladder, *&c.* The balſamic oil is moſt uſed externally, but often given with good ſucceſs in old gleets; a diſeaſe which frequently puzzles the beſt phyſicians and ſurgeons.

I muſt not omit to inſtruct you how to diſcover the various adulterations of ſalt of amber, which being now much uſed by our learned phyſicians, ſome diſhoneſt (as there are ſome in all profeſſions) chemiſts, for filthy lucre's ſake, mix it with ſal armoniac; others with creme of tartar; and others, with ſalt of coral: if with the firſt, you'll ſoon perceive a ſtrong vinous ſcent, when you grind it with a little ſalt of tartar. The ſecond ſhews itſelf by being put into clear water; for the ſalt of amber will diſſolve long before the creme of tartar: and the laſt cheat is diſcovered by trying this ſalt upon a red-hot iron; for the genuine ſalt will fly away; the vinegar which the coral had abſorbed, will be deſtroyed, and nothing but an inſipid earth left upon the iron.

The compound Oil of Amber.

TAKE amber finely powdered, olive-oil, of each, one pound; put them into a retort; place it in a ſand-furnace, and give it a gradual fire, till all is diſtilled. When cold, take off the receiver, in which you will find an oil with a ſtronger gas than that from ſulphur: put it inſtantly into a bottle, very cloſe, for uſe.

THIS is a wonderful paralytic. The doſe from five to fifteen drops. For internal uſe, ſome ſucceſsful practitioners mix one dram of this oil with one ounce of compound ſpirit of lavender, and give from ten to forty drops at a doſe. Externally, they order ſix ounces of camphorated ſpirit of wine, and half an ounce of this oil to be well ſhaken together; and with it foment the parts affected.

“ Hoffman's *Spirit of Amber.*

TAKE of tranſparent yellow amber, reduced to an impalpable powder, and ſalt of tartar, of each half a pound. Grind them well together in a marble mortar: put the mixture into a retort; and pour upon it two quarts of highly rectified ſpirit of wine. Then let them ſtand to digeſt ſome time in a ſmall heat: afterwards gradually increaſe the fire, and diſtill off the ſpirit to dryneſs.”

Tincture of Amber.

PUT four ounces of amber (in very fine powder) into a bolt-head; pour upon it twelve ounces of ſpirit of wine: invert a ſmall bolt-head into the mouth of the bigger; lute well the junctures, and ſet it to digeſt upon a heat of ſand four or five days, ſhaking it about two or three times in a day: when the ſpirit is well tinged of an amber colour, pour it into a vial, and put half a pound more of ſpirit of wine. Digeſt as before, which alſo will extract a tincture; both which put into a matraſs, and in a gentle heat of aſhes draw off one half of the ſpirit of wine, which will ſerve again for the ſame uſe; and put the tincture in a vial well ſtopped.

ITS operation is a little diaphoretic: it is given to hyſterical women, and is good for the apoplexy, palſy, and epilepſy. Its doſe from ten to ſeventy or eighty drops in any proper vehicle.

" *Tincture of Amber, with fixed Alkali.*

REDUCE four ounces of tranſparent amber into an impalpable powder: grind this diligently with an equal quantity of pure fixed alkaline ſalt. Expoſe the mixture in a flat glaſs veſſel to the moiſt air of a cellar; it will ſoon relent, and run per deliquium. Dry ſlowly, with a gentle heat, the unctuous liquor, continually ſtirring it all the while: powder the maſs, and put it into a tall bolt-head: pour upon this a quart of *Hoffman*'s ſpirit of amber: ſet the glaſs in a gentle heat for three or four days, ſhaking the veſſel every now and then.

THIS medicine *Hoffman* recommends as of great efficacy in nervous diſorders, and rheumatic complaints. A few drops are a ſufficient doſe. It may be taken in wine; which it does not, like the common tinctures, render turbid [s]."

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[s] Obſervat. Phyſico-chym. lib. i. obſ. 17.

The Powers of Amber.

TAKE oil of amber, one ounce; the volatile ſalt of ſal armoniac, half an ounce; grind the oil and ſalt well together in a little mortar; pour to them, ſpirit of wine tartarized, half a pound; and put them afterwards into a bolt-head: invert a little glaſs to make it fit for circulation. Lute well the joint, and put it on warm ſand, to ſtand in digeſtion four or five days, ſhaking it two or three times every day; in which time, the ſpirit of wine will have imbibed the oil and ſalt: ſet it by, and when it is cold, put it in a vial, well ſtopped, and keep for uſe.

ITS operation is diaphoretic and diuretic: it is of the ſame uſe with the oil, ſpirit, and ſalt of amber; and is an excellent medicine againſt the cholic in the ſtomach or bowels. Its doſe is from ten drops to half a dram or two ſcruples. If you put ſal volatile oleoſum, inſtead of the ſal volatile armoniacum, it will be more acceptable to ſome perſons.

" CHAP. XXI.

Of AMBERGREASE.

AMBERGREASE is a bituminous ſubſtance of an aſh-colour. It melts in the fire into a gold-coloured ſubſtance, is eaſily inflammable, and totally ſoluble in ſpirit of wine and eſſential oils; with the firſt it concretes into a butyraceous ſubſtance; if the ſpirit be partly abſtracted, the remainder turns to a white foliaceous matter, not unlike ſperma ceti. Pure ambergreaſe has no particular taſte. Ambergreaſe, upon a chemical analyſis, yields firſt a pellucid phlegm, like the pureſt water; then a brown ſpirit, like beer; afterwards an oil of a deeper colour; and at length, in a very ſtrong fire, a thick balſam. The oil and balſam have the ſame ſmell with thoſe of amber."

"*Preparations of Ambergreaſe.*

"*Eſſence of Ambergreaſe.*

TAKE of pure ambergreaſe, half an ounce; of tartarized ſpirit of wine, (common rectified ſpirit will do[t]) ſix ounces. Put them both in a tall bolt-head of ſuch a ſize that they may fill only one third of it: place this in a ſand-furnace, and gradually heat the liquor till it boils: a perfect ſolution will ſoon enſue[u]."

Compound

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[t] If the ſpirit of wine uſed for this preparation be digeſted for ſome time on a pure fixed alkaline ſalt, the eſſence will prove deeply tinged. A ſmall quantity of any fragrant eſſential oil added to the ſpirit, makes it prove not only a more powerful menſtruum, with regard to the ambergreaſe, but likewiſe gives the eſſence an exceeding fragrant ſmell.

[u] If the eſſence of ambergreaſe be kept in a bottle not well ſtopt, or if it has ſtood in a glaſs not quite full, ſome of the ambergreaſe will precipitate in the form of a white butyraceous matter. See a farther account of ambergreaſe in *Geoffr. Mat. Med.* tom. i. p. 651. *Phil. Tranſ.* No. 433, 434, 435; in *Baddam's Abridgment*, vol. x. p. 28.

“ *Compound Eſſence of Ambergreaſe.*

TAKE of pure ambergreaſe, two drams; muſk, twelve grains; civet, two grains. Rub theſe well together in a glaſs mortar; put the mixture into a tall glaſs bolt-head; pour upon it of highly rectified ſpirit of wine, (which has been digeſted ſome time on a fixed alkaline ſalt) four ounces. Set the bolt-head in a ſand-furnace, or in a water-bath; digeſt them for ſome time with a ſmall heat; then gradually increaſe the fire, till the ſpirit boils, in which ſtate keep it for ſome time: when the tincture is grown cold, decant it from the feces, and keep it in a bottle well ſtopt for uſe.

THE doſe of this eſſence is from one to ten drops. It is to ſuch people as can bear the uſe of perfumes, a very high cordial.”

A COMPLETE COURSE OF CHEMISTRY.

PART II.

CHAP. I.

Of VEGETABLES.

ALL plants proceed from ſeed, in which they are for ſome time ſhut up, as in a matrix, till the ſaline humidity of the earth and heat has penetrated and ſoftened the outer part of the ſeed, entered its pores, and given extenſion to the young plant, by which its parts become perceptible.

PLANTS are nouriſhed by their roots, which receive their nutriment by pores, and are afterwards exalted by the heat of the ſun, which diſtributes itſelf into the fibres of the plant, and cauſes ſuch a filtration and circulation of the juices, as give nouriſhment to the vegetable parts: the moſt exalted and ſubtile parts whereof, aſcend to the flowers and fruit; the moſt aqueous and leſs rarefied, give nouriſhment to the leaves and branches. From the more oily part proceed gums and reſins; and from the more groſs and terreſtrial, is compoſed the bark [w].

CHAP.

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[w] The parts common to vegetables are, a ſtem, or trunk, leaves, flower, fruit, and roots. The trunk contains much earth, ſalt, reſin, or pitch, and but little water; all of them of a groſs kind: the leaves hold the ſame ſubſtances; and the ſeed, or fruit, abounds in oil. Wine, tartar, and ſugar, are artificial preparations: reſins and gums are violent productions; but manna and honey are obtained by both theſe ways; though manna rather by the latter, and honey by the former. Some plants contain a ſalt manifeſtly nitrous; ſuch are brook-lime, pellitory, *&c.* An acid ſalt is found in fruits before they attain the point of maturation: this ſometimes proves auſtere and aſtringent, as in pears, *&c.* Sometimes it is but little aſtringent, but highly acid, as in lemons, barberries, *&c.* in all which, this ſalt is ſo powerful as to diſſolve ſome metals, eſpecially iron, and all kinds of terreſtrial bodies, as crab's-eyes, chalk, *&c.* Vegetables yield ſubſtances which are almoſt totally inflammable; ſuch are pitch, reſins, and oils. Theſe are found in different ſpecies, and different parts of vegetables: reſins lodge in the barks of trees, and the ſtems or leaves of plants; but oils in the finer leaves, flowers and ſeeds. Reſins yield an oil, an acetous ſubſtance, and a groſs pitchy ſubſtance, a black matter remaining, which being burnt in the open air, falls into a fine white earth. Vegetables in general, ſhut up in proper veſſels, yield to the action of the fire, an inſipid phlegm, an acid ſpirit,

urinous

CHAP. II.

Of CORAL.

IT is a petrefied plant, which ſhoots out from rocks in the bottom of the ſea: there are three ſorts of it, *viz.* red, white, and black. The red is

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urinous ſalts, fetid and black oils, and in the open air, fixed alkaline ſalts and earths. The juices of plants, which are at firſt thin and watery, agitated by the alternations of moiſt, dry, cold, and hot weather, and by the mixture and action of the various contents of the atmoſphere, are elaborated into new and peculiar juices, proper to the particular ſpecies and part of the plant: hence ariſe various kinds of ſalts and oils, which are not only placed in particular parts of the plant, but are found in different quantities, at different ſeaſons: thus ſeeds yield little or no oil to the preſs, unleſs full ripe; and thus fragrant plants have not near ſo much ſmell in moiſt ſeaſons, nor give out the quantity of oil which they do in the dry ones: the ſame difference may be obſerved between plants in their infancy, and in their mature ſtate, between young and old trees; the firſt of which partake more of the ſaline principle, the latter of the oily one. Plants may be conſidered of different ſpecies with regard to chemical operations: thus mint diſtilled with water, in proper veſſels, affords an eſſential oil, which it were in vain to expect from ſorrel: on the other hand, ſorrel yields a larger quantity of natural ſalt, upon ſetting its juice to cryſtallize, and of fixed alkaline ſalt after incineration: while muſtard-ſeed differs from them both, giving little or no oil on diſtillation with water, but affording a large quantity when ground and preſſed; expoſed to the immediate action of the fire, the difference ſtill increaſes; a volatile ſalt now ariſes, and a fetid oil like that obtained, by a ſimilar proceſs, from animals; the reſiduum being burnt in the is moſt in eſteem and uſe; the white next: but of the black, I have never met with any preparation. The red is found in the ſeas of the *Eaſt-Indies* and the *Mediterranean*: ſome ſay it is green and ſoft under water, and by the air, is preſently turned red and hard. The black is often upon the ſame branch with the red. The white is found in the *Weſt-Indian* ſea, upon the coaſt of *Spain*, and in the Weſt of *England*, upon the coaſt of *Cornwall*. The chemical preparations of the red, are the tincture, magiſtery, and ſalt; and of the white, the magiſtery and ſalt: but ſome prefer the uſe of coral, brought into an impalpable powder, by grinding only, before any other preparation whatſoever [x].

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the open air, leaves but little earthy parts behind it, which yield, upon elixation, none of the fixed ſalt obtainable from the two former ſubjects. Theſe circumſtances demand the particular attention of the practical chemiſt, to enable him to practiſe his art to any advantage.

[x] Coral is a ſea plant, without leaves, but having flowers and ſeeds. It is of various colours; but the moſt uſual is red and white, which are the two ſorts alone made uſe of for medicinal purpoſes. Coral, upon a chemical analyſis, yields a ſmall portion of an urinous ſpirit, mixed with a black fetid oil, and a little fixed ſalt, differing very little from ſea ſalt. Red coral calcined in an open fire, loſes its colour, and becomes white: from the calx, iron may be extracted by applying a load-ſtone. Digeſted in eſſential oils, it imparts its red colour to them. Coral is ſoluble in every kind of acid ſpirit.

Preparations of Coral.

Salt and Magiſtery of Coral.

TAKE what quantity you pleaſe of red or white coral, in fine powder; put it into a clean ſmooth earthen diſh, or wide-mouthed glaſs; mix with it diſtilled vinegar, and there will ariſe preſently a ſtrong ebullition; when it is over, put more diſtilled vinegar to it; and ſo continue to do, as long as you perceive any fermentation: then ſet it upon warm ſand, ſtirring it now and then with a clean tobacco-pipe, till you ſee the heat excites no effervescence; then filtre the liquor, put by the moiety of it for the magiſtery, and the other part evaporate to dryneſs in a gentle heat; which is the ſalt of coral.

AFTER the ſame manner you may make ſalt of crabs-eyes, or of any teſtaceous powder.

MAKE the evaporation in a glaſs veſſel, with a wide mouth, and in a gentle heat of ſand: an earthen veſſel will ſuck up a great deal of the ſalt, and too ſtrong a heat will diſcolour it.

ITS operation is diaphoretic and diuretic, and is ſaid to revive and fortify the heart, ſtop bloody-fluxes, and all other hæmorrhages, and to reſiſt poiſon. Its doſe from ten grains to one dram.

UPON the other part of the liquor, drop oil of tartar per deliquium, upon which will ariſe a white curd, and will in a little time precipitate to the bottom:

tom: when the liquor is clear, drop in more; and if it turns the liquor white as before, let it ſettle; and ſo continue, till the liquor will not curdle by the oil of tartar. When the magiſtery is all ſettled, decant the liquor, and put clean water to the magiſtery; ſhake it about, let it ſettle, and decant as before; and ſo do five or ſix times, till the magiſtery has loſt all its ſalt taſte: dry it gently, and keep it for uſe.

When it is well ſettled, and waſhed ſweet, you may drop it upon a clean chalk-ſtone, to abſorb the humidity, and then dry it further between paper, in the ſhade.

It is endued with the ſame virtues as the ſalt. Its doſe may be augmented to four ſcruples.

The Tincture of Coral.

It is made ſeveral ways, and with divers menſtruums, which by time and heat becoming red, it is thought (with good reaſon) that the tincture proceeds more from the ſpirits than from the coral: I will therefore give you one, which I think to be the moſt genuine tincture of coral.

Reduce half a pound of red coral into impalpable powder, and mix it with equal its weight of ſublimed ſal armoniac, alſo in powder: put the mixture into a retort, which place in ſand; fit to it a receiver, and having luted well the junctures, make a fire of the firſt degree, one hour; proceed to the ſecond, which continue two hours; go on to the third, and keep it there three hours, or till all the ſal armoniac is ſublimed. It will be tinged with variety of colours, as red, green, blue, *&c.* and contain in it the true tincture of coral; which is apparent by its body being left white in the bottom of the retort. Put all theſe ſublimed flowers into a matraſs; and to every four ounces of the flowers, put ten ounces of tartarized ſpirit of wine: ſet them upon warm ſand, in a double veſſel, to digeſt, for three or four days, and ſhake them every day two or three times: when the ſpirit of wine is well tinged, put on more, and let it ſtand as before. Then put the tinged ſpirits together (being twenty ounces) into a matraſs; draw off twelve or fourteen ounces, and the ſix or eight remaining, will be deeply tinged with the ſulphur of coral.

Its operation is diaphoretic and diuretic. Its doſe from ten drops to one dram.

THE ſal armoniac ought to be prepared by diſſolution and ſublimation, ſo that no heterogeneous matter may be elevated with the genuine ſulphur of coral.

CHAP. III.

Of JAPAN EARTH.

IT is brought from *Japan*, and by the natives called *Catechu*: in colour and weight it differs;

ſome make nine or ten diſtinct ſorts of it. But be it of what colour it will, that which is lighteſt, breaks ſmooth, and is moſt ſtyptic on the tongue, is beſt. In taſte, it is ſomething bitter, but not unpleaſant; it prepares the palate to receive wine with much pleaſure. There are ſeveral compoſitions of it made into troches; that moſt in eſteem, is called *Catechu* [y].

Catechu.

MAKE what quantity you pleaſe of *Japan* earth into powder; diſſolve it in barley-cinnamon water; pour off the diſſolution from the feces, and dry it gently: when it is dry, mix two ounces of it with three ounces of ſugar-candy; ambergreaſe, half a ſcruple; muſk, fifteen grains; and butter, or (as they call it) ſpirit of roſes, fifteen drops: grind them all extremely well together, till they are impalpable; and with the mucilage of gum tragacanth, make them into little pills of the bigneſs of pearl-barley.

ONE of theſe pills held in the mouth, cauſes a ſweet breath, and renders all liquors very palatable; forty or fifty of them diſſolved in the mouth, and ſwallowed in a day, help catarrhs, fluxes of the belly, the bloody-flux, and overflowing of the terms: it is alſo an excellent medicine in a gonorrhæa, and even old gleets.

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[y] *Japan* earth, *Catechu*, is a hard gummy juice, ſomewhat reſinous, of a red colour inclining to black, and of an aſtringent bitteriſh taſte, which afterwards turns upon the palate ſomewhat ſweet and grateful. It diſſolves freely in water, readily takes flame in the fire, and burns almoſt entirely away, leaving but few aſhes.

The Tincture of Japan *Earth.*

POWDER finely four ounces of *Japan* earth; of the beſt cinnamon, one ounce; of Peruvian bark, an ounce and a half; let them be made alſo into fine powder, with muſk and ambergreaſe, of each ſix grains; let the two laſt be well ground with one ounce of ſugar-candy. Put them all into a matraſs, and pour on them ſpirit of wine, twenty-four ounces: make of the matraſs a circulating veſſel; lute well the juncture; ſet it upon warm ſand to digeſt four or five days, ſhaking it about two or three times a day: then ſet the matter by to ſettle, and by gentle inclination pour it into a vial, and keep for uſe.

IT is good for all the aforementioned purpoſes, and alſo an excellent antifebrific. Its doſe is from half a ſpoonful to three or four, in wine, or any other proper vehicle.

CHAP. IV.

Of JALAP.

IT is a root brought to us from *America*, ſliced and dried; that which is moſt ponderous, and breaks with ſhining black reſinous veins, is beſt. It is a great cathartic, and purges watery humors: the powder of it is given in white-wine, from ten grains to one dram and a half [z].

Reſin of Jalap.

TAKE of ſelect jalap, one pound; powder it, and put it into a matraſs; put to it ſix pounds of rectified ſpirit of wine; invert a bolt-head, and lute it; ſet it upon warm ſand three or four days, and ſhake it every day two or three times: when the ſpirit is well tinged, decant it carefully through a hair ſieve into a cucurbit; which ſet in a gentle heat of ſand, or balneum, and draw off the ſpirit of wine to one pint, which you may return upon the jalap, to make a ſecond extraction: decant the ſpirit as formerly; lute on a head and receiver, and diſtill as before. Let all cool, and in the cucurbit you will find the reſin in form of turpentine; which waſh in three or four waters, and in a gentle heat dry it, till it will beat into powder.

ITS operation is cathartic. It is given to open obſtructions, and in dropſies, made into pills or an electuary.

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[z] Jalap is the root of an *American* plant of the *convolvulus* kind. From twelve ounces of the beſt ſort of it may be obtained, by the means of ſpirit of wine, three ounces of reſin, and four ounces of extract from the reſiduum, by boiling it in water.

electuary. Its doſe from three grains to one ſcruple.

" *Extract of Jalap.*

TAKE of the moſt ponderous, black, ſhining jalap, what quantity you pleaſe; powder it, and put it into a pewter balneum, placed in a ſtill in which there is already a ſufficient quantity of water. Pour upon the root about twelve times its weight of rectified ſpirit of wine; lute on the head, and apply a gentle fire, ſo as to make the ſpirit run, in a ſmall ſtream, from the noſe of the worm: when about one third of the ſpirit is come over, let the fire go out, and pour what has diſtilled, back, through an aperture in the head made for this purpoſe, into the balneum: as ſoon as the whole is grown cold, and perfectly ſettled, take out the balneum, and warily decant the menſtruum (which will have extracted nearly all the reſinous parts) through a hair ſieve, to prevent any lighter feculencies from paſſing with it: pour upon the remainder half as much ſoft water as you uſed ſpirit; put the balneum into the ſtill; lute on the head, and apply fire as before. When no more will come over, and the water in the ſtill begins to boil, ſuffer the fire to decay, and as ſoon as the ſtill is grown almoſt cold, take out the balneum, and ſtrain the liquor (which will have diſſolved nearly all the gummy and ſaline parts) through a flannel bag: ſtrongly preſs the feces, and ſtrain the liquor to the reſt; evaporate this in a broad iron or pewter pan, over a ſoft equable fire, to the conſiſtence of a ſyrup; then mix it well with the tinged ſpirit, and put it into the balneum: apply a gentle fire, and diſtill as before, till no more ſpirit ariſes, when the head may be unluted, and the extract poured out, whilſt hot, into proper veſſels. The ſpirit which is diſtilled will ſerve for the ſame purpoſes as before.

THIS extract purges ſufficiently, without that violent irritation which reſin of jalap but too frequently occaſions. It is of a more uniform ſtrength than the root itſelf, and is therefore more convenient."

CHAP. V.

Of RHUBARB.

IT is a purgative root, brought to us from *Turkey* and *Eaſt-India*: it is the product of ſome parts of *China* and *Tartary*. The moſt compact, (not flinty) which cuts in grains like nutmegs, and is of a pleaſant flavour, is beſt: and obſerve, that generally the ſmall pieces exceed the great ones in goodneſs, as being leſs ſubject to corruption. After its purgative operation is over, it binds, and is therefore given in fluxes.

ITS doſe is from ten grains to two drams.

Extract of Rhubarb.

BRUISE, or cut into very thin ſlices, what quantity of rhubarb you pleaſe ; ſteep it ten or twelve hours in a ſufficient quantity of diſtilled rain water, or any proper ſimple diſtilled water ; let the liquor juſt ſimmer, and then paſs it through a ſtrainer : infuſe the remainder in more water, as before ; paſs and preſs it hard through the ſtrainer ; put the infuſions together, and let them ſettle : then, by gentle inclination, pour off the clear tincture from its reſidence, and evaporate to the conſiſtence of honey, and it is the extract of rhubarb. All extracts made with water, are apt to grow mouldy ; therefore if you intend to keep them long, they ought to be made with ſpirit of wine.

AFTER the ſame manner are all the vegetable extracts made, except reſins, which require ſpirit of wine to diſſolve them : alſo obſerve, when you make the extract of any aromatic herb, flower, or ſpice, that inſtead of evaporation, you diſtill the water, and ſave it for uſe, *&c.*

CHAP. VI.

Of GUAIACUM.

GUAIACUM is the wood we call lignum ſanctum, and lignum vitæ : it grows in ſeveral places of the *Weſt-Indies*, and is a tree of great magnitude. It is ſudorific, and much uſed in decoctions. That which is moſt compact, reſinous, and ponderous, is beſt. Its gum is both ſudorific and cathartic.

Spirit and Oil of Guaiacum.

FILL an earthen retort two thirds full, with ſuch duſt of guaiacum as you have at the turners; place it in a reverberatory, and lute to it a receiver; give it a fire of the firſt degree one hour; increaſe it to the ſecond, and keep it there two or three hours: go on to the third two hours; and ſo to the fourth for two hours more, or untill you ſee no more fumes will come into the receiver: let it cool, and take off what is diſtilled, and put it into a coffin of filtring-paper, in a funnel; the ſpirit will filtre through the paper, and the oil will remain in it. Put the ſpirit into a glaſs retort, ſet it in a ſand-furnace, fit on its receiver, and give it a fire of the firſt degree, to raiſe the phlegm: when you perceive the drops to come acid, remove the receiver, and put away the phlegm as uſeleſs. Put on the receiver again, and lute it, increaſing the fire gradually to the ſecond and third degree, and it will bring over all the ſpirit, which put in a vial for uſe.

THE oil may be rectified in a retort: it is generally uſed for the tooth-ach, and to clean rotten bones, without rectification. Its operation is diaphoretic. Its doſe from two to eight or ten drops.

The ſpirit is diaphoretic and diuretic. Its doſe from twenty drops to ſixty or ſeventy.

YOU may calcine the caput mortuum to a white aſh, and then with warm water extract the ſalt, as you will ſee hereafter, of other vegetable fixed ſalts.

CHAP. VII.

Of the Jeſuits, or Peruvian *Bark.*

IT was brought to us from *Peru* in *New Spain*, and its uſe firſt taught us by the jeſuits: there have been, for ſome years, two ſorts of it, *viz.* the cultivated and the wild: the cultivated is the beſt; and the beſt of that kind, is that which is moſt compact, bitter, and of a reddiſh colour.

IT is a certain remedy to hinder the fits of an ague, (if judiciouſly preſcribed, otherwiſe it is very pernicious;) and it is given either in powder, or infuſed in wine.

The Infuſion of Peruvian *Bark.*

TAKE of the bark in powder, two ounces; put it into a matraſs, and to it, two quarts of white, or pale red wine: fit the matraſs for circulation, and ſet it upon warm ſand, or in balneo, forty-eight hours; ſhake it about two or three times a day: then let it cool, and pour off the infuſion

fuſion (through a ſtrainer) into a vial, and keep for uſe.

Two or three ounces of this infuſion are given three or four times a-day in agues; but never in the paroxyſm. Dr. *Smith* of *Paris* (who was Sir *Robert Tabor*'s ſucceſſor there) made his infuſion in pale red wine.

The Tincture of Peruvian *Bark.*

TAKE four ounces of the bark in powder; put it into a bolt-head, and pour on it of tartarized ſpirit of wine, twelve ounces: invert a leſs bolt-head into the mouth of the other, to make a double veſſel; which ſet in a gentle heat of ſand, balneum, or baln. vapor. four or five days, ſhaking it every day two or three times: then decant the tinged ſpirit of wine carefully into a vial; which keep for uſe.

ITS doſe is from one ſcruple to one dram, or one dram and a half; and in ſome caſes to half an ounce; to be given in any convenient vehicle, as a febrifuge, beginning its uſe immediately after the paroxyſm.

The Extract of Peruvian *Bark.*

PUT half a pound of *Peruvian* bark in powder, into a large matraſs; put to it of the ſimple diſtilled water of wormwood, carduus, or any other proper water, five or ſix quarts: place it in ſand, and let it boil gently, two or three hours:

ſtrain it; put more diſtilled water to the bark; boil and ſtrain as before; put the infuſions together, and in a glaſs or earthen veſſel evaporate gently, to the conſiſtence of honey. Put this extract into a pot for uſe [a].

ITS doſe is from fifteen grains to one dram, in pills, or diſſolved in wine. It is endued with the ſame virtues as the former.

CHAP. VIII.

Of SUGAR.

IT is the eſſential ſalt of a reed, which grows in the *Eaſt* and *Weſt-Indies*: that from *Brazil*, brought into *Europe* by the *Portugueſe*, is accounted the beſt, which is called *Brazil* or *Liſbon* ſugar; but that which now we have from *Barbadoes* and *Jamaica*, is very good, and by the refiners of ſugar is made equal to any other in goodneſs. It is refined by diſſolution, and the ſeparation of its earthy, groſs, oily, and moloſſus part: that which is made moſt white and acceptable to the eye, is refined by the help of lime-water; and being evaporated to a due conſiſtence, is put into moulds of a pyramidical form, with a hole in the bottom, to let the more feculent part run out.

SUGAR-CANDY is made of both refined and unrefined ſugar, by boiling of them in water, and ſetting them to cryſtallize in veſſels; in which they put little ſticks for the cryſtals to adhere to. The white candy is of the refined ſugar, and the brown of the unrefined [b].

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[a] This extract may be more conveniently made in the ſame manner as the extract of jalap. See page 242.

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[b] Sugar is an artificial concrete, prepared from the juice of the ſugar cane, by boiling it gently in copper veſſels: this occaſions the lighter feculencies to riſe to the top, from whence they are carefully ſcummed off; while the more ponderous ſubſide to the bottom of the veſſel. The purified ſyrup is then mixed with a due portion of lime-water, and gently boiled; which diſpoſes it to granulate, or form ſaline concretions: theſe are ſeparated from the more liquid parts by ſuitable contrivances. By this means, the juice of the cane is made to aſſume the form of coarſe ſugar: this is ſtill further purified, by the addition of quick-lime, and repeated coction. When it is, by theſe means, brought to a due conſiſtence, it is poured out into conical earthen moulds, having a perforation at their ſmaller end, which is placed lowermoſt: through this hole, the moloſſus, or coarſer ſyrup, drains; while the purer ſugar is left behind, in a ſolid maſs, or loaf. By prudently repeating this proceſs once or twice, certain circumſtances being duly obſerved, the ſugar is brought to its ultimate degree of purity and perfection. Sugar, like other ſalts, readily diſſolves in water, and, in a certain quantity of it, ſhoots into regular cryſtals, of a priſmatic figure, compoſed of eight plain ſuperficies: the two oppoſite baſes are equal and parallel. A weak ſolution of ſugar, expoſed to a gentle warmth, ſoon loſes its tranſparency, ferments, and is converted into a genuine wine, which, upon diſtillation, yields a pure inflammable ſpirit. If the fermentation is promoted or continued for a ſufficient length of time, an excellent vinegar is formed. Sugar, thrown upon live coals, emits a copious fume, and at length burns with a clear flame, leaving behind it an earthy ſubſtance. Diſtilled in cloſe veſſels, it yields an acid ſpirit, and an empyreumatic oil, a black coal remaining at the

SUGAR-CANDY is accounted a good pectoral, and given in diſeaſes of the breaſt and lungs.

Spirit of Sugar.

TO one pound of powdered ſugar, put three pounds of fullers-earth, alſo in powder; or, in its room, put ſo much ſand, clean waſhed; fill a retort half full of this mixture, place it in a ſand-furnace, and give it fire of the firſt degree for two hours; then increaſe it to the ſecond for two hours more; proceed to the third, where keep it, till no fumes appear in the receiver: then let all cool, and in the receiver you will find a fetid ſpirit and oil, which ſeparate as uſual. Put the ſpirit into a retort, or cucurbit; ſet to it a receiver unluted; make fire of the firſt degree, and there keep it, till you perceive the drops have a little acidity: put away the phlegm; lute on the receiver, and increaſe the fire to the ſecond degree, where keep it till all is come off.

IT diſſolves pearl and coral, and is alſo accounted a good medicine in the ſtone and gravel in the bladder and kidneys. Its doſe is from ten to fifty or ſixty drops, in any appropriated liquor. The ſand, or other

the bottom of the diſtilling veſſel, from which, after it is throughly calcined, may (according to *Geoffroy*) be obtained a ſmall portion of fixed ſalt. Sugar, boiled along with vegetables, imbibes their reſinous and mucilaginous ſubſtance. Ground with diſtilled oils, it renders them perfectly miſcible with water.

other bole, is mixed with the ſugar to hinder its boiling over. The veſſel in which you diſtill it, ought to be at leaſt half empty. The inſipid water which comes over in the rectification, ought to be kept by itſelf, changing the receiver as ſoon as you perceive the drops which fall, to be of an acid taſte. If you put a tenth part of dulcified ſpirit of ſalt to the ſpirit of honey, or ſugar, in their rectification, it will make them of a more grateful ſmell, and not leſſen, but rather increaſe their virtues. Laſtly, urge not the fire too ſtrongly at the latter end, leſt you raiſe ſome of the fetid oil.

The Compound Spirit of Sugar-Candy.

TAKE of ſugar-candy, (white or brown) half a pound; of ſal armoniac, four ounces; both made into fine powder, and well mixed: put them into a retort, which muſt be two thirds empty; place it in a ſand-furnace, and make fire of the firſt degree for an hour; increaſe it to the ſecond, and there continue it as long as the drops fall at the diſtance of one ſecond of time: proceed then to the third degree, and let it remain there, till no more fumes appear in the receiver. In it, you will find an empyreumatical ſpirit, with a little oil; take out this ſpirit and oil, put them into a clean retort, and rectify in a gentle fire of ſand, leaving the oil in the bottom of the veſſel; and you will have a clear ſpirit more agreeable than that of the firſt diſtillation. It is more aperitive than the former, and its uſe and doſe the ſame.

The ardent Spirit of Sugar.

TAKE coarſe ſugar [c], or moloſſus [d], *q. v.* put to it ten or twelve times its weight of water, and let them ſtand a ſufficient time to ferment; as ſoon as the fermentation is over, put the liquor into a copper ſtill, with its refrigeratory, and give it a gradual fire, till it begins to drop: obſerve then ſo to manage the fire, that the ſpirit may come from the mouth of the worm in a ſmall thread; and ſo continue, till that which diſtills is inſipid: then let out the fire, and rectify the ſpirit by a ſecond diſtillation, either in a glaſs body and head, or (if your quantity be great) in a copper veſſel; obſerving to ſeparate the ſpirit from the phlegm, as in the firſt diſtillation; which may be further rectified, till it burns all away.

IT is of the ſame uſe with ſpirit of wine, and is preferable to all but that of the grape.

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[c] A hundred weight of brown ſugar, will afford eighty pints of proof ſpirit. *Slare*'s *Vindication of ſugar.*

[d] A hundred weight of good moloſſus will yield, according as it is managed, from four to ſeven gallons of alcohol.

CHAP. IX.

Of ESSENTIAL OILS.

ESSENTIAL oils are ſuch as retain the ſmell and taſte of the ſpices, gums, herbs, flowers, berries, ſeeds, and woods, from which they are drawn, *viz.* cinnamon, cloves, nutmegs, *&c.* Benjamin, balſam of *Peru*, ammoniacum, galbanum, capivii, turpentine, *&c.* Mint, balm, marjoram, wormwood, pennyroyal, roſemary, ſage, cammomel, *&c.* Anniſeeds, coriander-ſeeds, carraway-ſeeds, cummin-ſeeds, ſweet fennel-ſeeds, *&c.* Juniper-berries, bay-berries, *&c.* Rhodium, ſaſſafraſs, *&c.* [e]

The

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[e] Eſſential oils are ſuch as contain in a ſmall compaſs the odour, and ſometimes the taſte and peculiar virtues of the plant from which they are extracted: ſuch ſubſtances as are deprived of this oil, are perfectly undiſtinguiſhable from each other, either by their ſmell or taſte. Eſſential oils, expoſed to the air for a length of time, loſe their fragrancy, and become viſcid and thick; by this means oftentimes the more grateful oils acquire a diſagreeable ſmell and taſte. Being diſtilled without any addition, they exhale ſome aqueous parts, and afterwards become more clear, liquid, penetrating, and light; leaving at the bottom of the diſtilling veſſel, in a ſtrong heat, a black, fixed, ſpongy matter: Mr. *Boyle* by this means reduced a pound of eſſential oil almoſt wholly to earth. Ground with thrice their weight of pure dry ſea-ſalt, and diſtilled, they are ſaid to grow clean, pure, limpid, and fitter for keeping; a groſs matter remaining behind: but their ſmell receives a notable alteration

for

The manner of diſtilling Eſſential Oils.

TAKE what quantity of any ſpice, gum, berry, ſeed, herb, or wood you pleaſe, ſuch as are proper to be bruiſed or powdered; let them be put into a copper ſtill, and to them put eight or ten

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for the worſe by this treatment. The lighteſt and moſt limpid eſſential oil, being ſet on fire, is reſolved into a large quantity of fuliginous matter, which being catched by proper contrivances, affords a fine black pigment for the uſe of painters, *&c.* Eſſential oils are readily ſoluble in highly rectified ſpirit of wine; but one with greater facility, and in greater quantity than another: upon diſtilling theſe ſolutions with the gentle heat of a water-bath, the finer parts of the oil ariſe along with the ſpirit; leaving behind a groſſer part, which is entirely deprived of the ſpecific diſtinguiſhing ſmell of the ſubject from which the oil was obtained. Eſſential oils readily unite with dry ſugar, and thus become ſoluble in water, with which they are likewiſe rendered miſcible, by being diligently rubbed with the yolk of an egg. Eſſential oils digeſted upon ſulphur, diſſolve it, and acquire a red colour. Mixed with fixed alkaline ſalt, they form a ſoap; which expoſed to the fire in proper veſſels, yields a volatile ſalt. Digeſted with a volatile alkaline ſpirit, they undergo various changes of colour, and ſome of the leſs odorous acquire conſiderable degrees of fragrancy by this means. Eſſential oils, volatile alkaline ſpirit, and rectified ſpirit of wine, readily unite into one volatile, ſaline, oily liquor. Theſe kinds of oils more readily unite with mineral acids, than with fixed alkaline ſalts. Mixed with the vitriolic acid, they efferveſce, throw out a ſulphureous vapour, and acquire a conſiderable degree of conſiſtence. With ſpirit of nitre, they efferveſce in an extraordinary manner, grow vaſtly hot, and ſome of them actually burſt out into flame. Digeſted with ſtrong ſpirit of ſalt, they change into a thick pellucid ſubſtance.

ten times their weight of common water; lute the head to the ſtill, and its refrigeratory or worm: make fire under it to make the liquor boil, and in a little time the water and oil will run into the receiver, which we call a ſpout-receiver, (ſuch as the figure at the beginning repreſents.) When you apprehend that all the oil is come off, hold a ſpoon under the noſe of the worm; and if you perceive any oil comes with the water into the ſpoon, continue the fire longer: if no oil appears in the ſpoon, let out the fire, and ſeparate the water from the oil[f].

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[f] Several methods have been propoſed, to improve the operation of diſtilling eſſential oils from vegetable matters; but few with any commendable ſucceſs: for, although it muſt be admitted, that in ſome caſes the quantity of oil has been conſiderably increaſed, yet its quality has been at leaſt proportionally debaſed. It is well known to the operator, that the oil which riſes firſt, more perfectly reſembles the ſubject from which it is obtained, than that which comes over towards the end of the diſtillation. It ſeems neceſſary to macerate the ſubject, before it is diſtilled, ſo long, as that the water may have ſufficiently penetrated its pores; to facilitate which, the wood ſhould be thinly ſhaved acroſs its grain, the ſeeds lightly bruiſed, the roots cut in thin ſlices tranſverſely, barks reduced to a coarſe powder, &c. The lighter and more porous ſubſtances require no preparation, but may be immediately diſtilled. Eſſential oils greatly vary in their virtues, according to the difference of the ſeaſon, the different age and perfection of the plant, or ſkill of the operator: too great a fire makes a diſagreeable impreſſion on them; too much water impoveriſhes them; both ſhould be proportioned to the quantity of oil

OBSERVE, firſt, few of theſe oils are worth diſtillation, except in great quantities; that is to ſay, ſeveral ſtills full.

SECONDLY, that you watch it at its firſt beginning to diſtill, to prevent its boiling over; and if you think the little ſtream runs too faſt through the

which the vegetable yields, and the difficulty with which it is ſeparated and diſtilled. Nor is the choice of proper and well proportioned inſtruments of little conſequence: the lighter oils will readily paſs over the ſwan-neck of the head of the common ſtill; while others are with difficulty elevated into the lower head deſcribed in the plates of inſtruments. I have frequently obtained from the flowers of lavender, roſemary, and ſuch like volatile and highly odoriferous ſubſtances, whoſe texture is ſo rare, as not to admit of any preſſure, or even maceration in water, without injury, an oil of great volatility and fragrancy, by ſuſpending the materials in the vapour of water made only juſt to boil. In ſome vegetable ſubſtances, the oil is ſo ſtrongly retained in their mucilaginous parts, as not to be eaſily ſeparated by ſimple maceration. In this caſe, it is convenient to ſlightly ferment the ſubject, by adding a little yeaſt to its infuſion in water: but great care muſt be taken not to continue the fermentation too long, which inſtead of promoting the ſeparation of the oil, will combine it with the water uſed in the infuſion, and ſo produce an inflammable ſpirit. However carefully eſſential oils are diſtilled, their ſmell is far leſs pleaſant at firſt than that of the ſubſtances from which they are obtained; but upon being kept for ſome time in veſſels ſlightly ſtopt, they depoſite a mucous ſediment, grow more limpid, and in time nearly reſemble the original plant, when they are immediately to be put up in ſmall bottles, which are to be kept quite full, cloſely ſtopped, and in a cool place: by theſe cautions, they will retain their virtues in great perfection for many years.

the worm, open the door of the fire-hole, and that will a little allay its vigour: if it be not ſufficient, interpoſe a fire-ſhovel between the fire and the bottom of the alembic, ſo as to keep it running in a ſmall thread, and after the firſt half hour of its working, you may be more bold with the fire.

THIRDLY, that you leave water enough in the ſtill to ſecure the matter contained in it from burning.

FOURTHLY, that you return the water you diſtilled off, upon the freſh matter in the ſtill, ſo long as it is the ſame ſpice, wood, or herb, you drew the firſt water from; for that water being filled with ſome oily particles of the vegetable from which you drew it, you will have, by returning it, more oil from the ſaid quantity of wood, ſeeds, or herbs, the ſecond diſtillation, than you had the firſt.

FIFTHLY, Alſo obſerve, that the oils of cinnamon, cloves, and ſaſſafras, being more concentrated and compact than the other, ſink to the bottom of the water, and all the reſt of the eſſential oils ſwim upon the ſurface of the water [g].

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[g] To the catalogue of oils which ſink in water, may be added thoſe of mace, pepper, cubebs, cardamoms, nutmeg, myrrh, pimento, ſcurvy-graſs, and rhodium. Mr. *Hoffman* found the ſpecific gravity of ſeveral eſſential oils by the following experiments. He took a glaſs, whoſe weight was two drams and forty-two grains: this filled with highly rectified ſpi-

SIXTHLY, obſerve, that the oils of anniſeeds, ſweet fennel-ſeeds, and roſes, will coagulate; therefore you ought ſo to order your matter towards the latter end of your diſtillation, to keep the worm warm to the very noſe of it, by which means

ſpirit of wine, weighed ſix drams and thirty-two grains; with olive oil, ſix drams and forty grains. This glaſs being ſucceſſively filled with eſſential oils, weighed as follows:

With oil of ſaſſafras, ſix drams and fifty-three grains.
Cloves, ſix drams and fifty-two grains.
Cinnamon, ſix drams and fifty-one grains.
Anniſeed, ſix drams and fifty grains.
Fennel, ſix drams and fifty grains.
Cinnamon adulterated with expreſſed oils, ſix drams and forty-eight grains.
Mint, ſix drams and forty grains.
Spike, ſix drams and thirty-ſeven grains.
Turpentine, ſix drams and thirty two grains.
Lavender, ſix drams and thirty grains.
Marjoram, ſix drams and thirty grains.
Citron peel, ſix drams and twenty grains.

The ſpecific gravity of oils is not to be abſolutely depended upon as a certain criterion of their goodneſs: for not to mention that one oil may be mixed with another of the ſame gravity, genuine eſſential oils themſelves are of different gravities, as they are diſtilled with a greater or leſs degree of fire. Many other circumſtances likewiſe happen, which promote this uncertainty: thus cinnamon and cloves, whoſe oils uſually ſink in water, warily and ſlowly diſtilled, yield at firſt an oil of exceeding fragrancy, which is nevertheleſs ſpecifically lighter than the aqueous fluid employed in their preparation; while, on the other hand, the laſt runnings of ſome of the lighter oils ſometimes ſink in water.

means the coagulated oil melts down into the receiver.

Oil of Saſſafras.

TAKE of the ſhavings, or the wood in powder, twenty-eight pounds; put it into a copper ſtill; to which put of clean water, twelve gallons: lute on the head, and ſet a ſpout-receiver to the worm; make a gradual fire, till it runs in a ſmall thread into a receiver; in which condition, keep it, till by holding a ſpoon under the noſe of the worm, you perceive no oil to diſtill with the water. When the operation is ended, ſeparate the oil which ſinks to the bottom, and put it up.

Its operation is diaphoretic and diuretic: it is given in the venereal diſeaſe, gout, ſtone, ſcurvy, and dropſy. Its doſe from three to ten or twelve drops.

After the ſame manner you may make the oils of rhodium, cinnamon, cloves, clove-bark, all aromatic herbs and ſeeds; and therefore I will not trouble you with any other proceſs of this kind[h].

As

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[h] It may here be convenient to add a catalogue of the quantity of eſſential oils, obtained from certain vegetable ſubſtances.

From

As I ſhewed you how to diſcern the genuine ſalt of amber from the ſpurious, ſo I ſhall here teach you

From Hoffman.

Two pounds of dried flowers of ſpike	yield	one ounce.
Two pounds of green flowers of ſpike		half an ounce.
Four pounds of lavender flowers		ſcarce an ounce.
One pound of balſam of Copaivi		ſix ounces.
Four pounds of mint leaves		an ounce and a half.
Ten pounds of lignum aloes		half an ounce.
Four pounds of marjoram		one ounce.
Six pounds of ſhavings of ſaſſafras		one ounce, ſix drams.
Two pounds of ſavin		five ounces.
Twelve pounds of roſes		ſcarce half a dram.
One pound of nutmegs		one ounce.
One pound of myrrh		two drams.
Fifty pounds of calamus aromaticus		two ounces.
Two pounds of cloves		five ounces.
Ten pounds of rue		from two drams to half a ounce.
Eight pounds of juniper-berries		three ounces.

From Lemery.

Sixty four ounces of cinnamon	yield	ſcarce ſix drams.
One pound of cloves (diſtilled per deſcenſum)		one ounce and two drams

From

ou how to diſcover when theſe vegetable chemi-al oils are adulterated. If they are mixed with il of turpentine, you cannot take a drop or two n ſugar, but you will ſoon perceive it. If with il of balſam of capivi, the fragrancy of the vege-able will be much weakened. But the common ay of ſophiſticating the dearer oils of cinnamon, loves, and ſaſſafras, is by adding a twelfth or ixteenth part of ſpirit of wine, which will quick-y and intimately unite with them. But this heat alſo you will eaſily diſcover, by dropping hree or four drops into a little water, which will ontinue milky a conſiderable time; but if the oils re true, they will ſink to the bottom, without diſ-olouring the water.

From my own obſervation.

buſhel of cummin ſeed —		one pound, five ounces.
buſhel of ſweet fennel-ſeed —		upwards of eighteen ounces.
hundred weight of caraway ſeeds —		five pounds, three ounces.
wo hundred weight of hyſſop —		ſix ounces.
hirteen hundred weight and two quarters of lavender	yield	three pounds, twelve ounces.
hundred weight of roſemary tops in flower —		eight ounces.
wo hundred weight of thyme in flower —		five ounces and a half.
Fifty-ſix pound of turpentine —		Thirteen pounds, nine ounces.

CHAP. X.

Of TURPENTINE.

IT is of a balſamic conſiſtence and nature, and comes by inciſion from ſeveral kinds of trees, *viz.* the turpentine-tree, in the iſland of *Chios*; alſo from the pine-tree, the larch, and fir. It is diuretic, and given in gonorrhœa's, ulcers of the reins, bladder, and matrix. Its eſſential, or ethereal ſpirituous oil, is drawn in water, in a large copper ſtill, as other eſſential vegetable oils are. From the colophony which remains in the copper ſtill, may be diſtilled by a retort its yellow oil and red balſam, as followeth.

The yellow Oil, and Balſam of Turpentine.

TAKE of the colophony which remains in the copper ſtill, after the ſpirituous oil is extracted, what quantity you pleaſe; break it into little pieces, and put it into a retort not above half full; place it in a ſand-furnace, heat it gradually to the ſecond degree of fire, and then ſome oil will drop into the receiver; augment that degree a little, and it will cauſe all the oil to diſtill; then change the receiver, and urge the fire to the third degree, which will cauſe yellow thick drops to diſtill, with ſome fumes: when the fumes decreaſe, augment the fire to the fourth degree, which will drive over the red balſam; when the receiver begins to cool, and the fumes diſappear, let out the fire.

By this method you may diſtill the oils and acid ſpirits of maſtic, frankincenſe, tacamahacca, gum elemi, labdanum, and all other gums of this nature.

CHAP. XI.

Of BENJAMIN.

IT is a reſinous fragrant gum, which diſtills out of a large tree growing in *Samaria*, and the countries adjacent; its greateſt conſumption is by the perfumers: its phyſical uſe is to reſiſt the malignity of humors. It is alſo pectoral and cephalic. That which breaks grey, and is full of white lucid ſpots, is accounted the beſt [i].

The Tincture of Benjamin.

POWDER four ounces of ſelect benjamin; put it into a matraſs, and put to it tartarized ſpirit

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[i] Benzoine is a brittle reſinous ſubſtance of a reddiſh colour, ſometimes interſperſed with white ſpots. It is obtained from a tree ſaid to grow in the kingdom of *Siam*. Benzoine readily takes fire, and then emits a very fragrant ſmell. Expoſed to a gentle heat in proper veſſels, it yields white ſhining cryſtals or flowers, which are readily ſoluble in ſpirit of wine: theſe are followed by a thin, yellowiſh, fragrant oil, intermingled with an acid liquor. Upon increaſing the fire, a thick butyraceous matter, and a deeper coloured oil, ariſe. There remains behind a light, ſpongy, black matter, without any taſte or ſmell.

ſpirit of wine, one pound; fit the matraſs for circulation, lute the joint, and ſet in warm ſand three or four days, now and then ſhaking it about: in that time it will acquire a fine tincture, which decant, and keep for uſe.

ITS chief uſe is to ſmooth the ſkin, and take away ſpots out of the face: one dram of it being put into four ounces of clean water, turns it white. This is called virgin's-milk. It is alſo uſed in aſthma's, and other diſeaſes of the lungs. Its doſe is from twenty to ſixty or ſeventy drops.

YOU may add to the four ounces of benjamin one ounce of ſtyrax, and alſo one dram of the balſam of *Peru*; they will not only render the ſcent more grateful, but alſo add to the deepneſs of the tincture.

Flowers of Benjamin.

PUT into a ſubliming-pot (of which you have the figure in the cuts) two or three ounces of benjamin in groſs powder; ſet on its cover, without luting[k], and keep it in the ſecond degree of fire in ſand, or immediately over a very ſmall fire of charcoal; the flowers will preſently begin to riſe into the cover, which once in an hour, or an hour and a half, muſt be taken off, and wiped out upon a clean ſheet of paper, with a feather. You ought to have two covers to one bottom, that you may clap on one as ſoon as the other is taken off. When you ſee the flowers begin to riſe yellow, take the melted benjamin out of the pot, with a ſpoon, and put into it more powdered benjamin, as you did at firſt, and ſo proceed, till you have as many of the flowers as you deſire. You muſt take care that the fire be not too big ; if it be, it forces up ſome of the oil with the flowers, and diſcolours them[1].

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[k] A conical cover made of paper is more convenient than one of glaſs or earth.

The Oil and Spirit of Benjamin.

TAKE of the black melted benjamin, (which you took out of the pot, after the ſublimation of the flowers) one pound ; put it into a retort, which place in a ſand-furnace ; cover it well with ſand, lute on its receiver, and make fire of the firſt degree for one hour ; then increaſe to the ſecond, in which you will have ſome oil and ſpirit, with ſome diſcoloured flowers ; augment the fire to the third degree, and at laſt to the fourth, till no fumes appear, and you will have a blackiſh oil, with an acid ſpirit, and the neck of the retort will be filled with the diſcoloured flowers, which you may take out, and put upon clean brown paper to ſuck up the oil. Theſe flowers (though not ſo beautiful) are as good for uſe as the former ; and though both the oil, ſpirit, and flowers, have acquired (at preſent) an empyreumatical ſcent, in ſix or eight months time their fragrancy will return.

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[1] One pound of good benzoine will yield from one ounce to two ounces of flowers.

The oil is a balſam for wounds. The ſpirit is diuretic. Its doſe is from ten to fifty drops, in any proper vehicle.

After the ſame method you may diſtill the oil, ſpirit, and volatile ſalt of the balſams of *Tolu* and *Peru*, &c.

If you have the quantity of two or three ounces of the black oil, you may put it into a cucurbit, which is capable of holding a gallon of liquor, in which you may put two or three quarts of water to the oil, and ſet it in a ſand-furnace, luting on its head and receiver, and give it a gradual fire, till the water is ready to boil. In this heat the ſpirituous part of the oil will diſtill with the water, of a fine amber colour, and a fragrant ſcent.

It is a good internal medicine, a powerful diuretic, and a ſpecific againſt the ſtone and gravel in the kidneys and bladder. Its doſe is from three to fifteen drops, in a little refined ſugar. The ſpirit may (before the rectification) be ſeparated by filtration.

CHAP. XII.

Of CAMPHOR.

IT is a volatile ſulphureous ſubſtance, which drops from a large tree, growing in the iſland of *Borneo* in the *Eaſt-Indies*. It is ſeparated from its dirt by ſublimation, and is brought to us in a tranſparent friable cake. The clear, white, and ſuch as is hard to quench, when ſet on fire, is the beſt. It is accounted a volatile alkali, ſaturated by nature with fatneſs[m].

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[m] Camphor is a ſingular concrete, extracted by art from a particular kind of tree in the *Eaſt-Indies*. It is brought to us in little ſemi-tranſparent pieces, or grains, of a reddiſh or aſh colour, a fragrant ſmell, and a ſharp pungent taſte. It is of ſo very volatile a nature, as to entirely exhale, in no great length of time, upon being expoſed to the free action of the air. Pure camphor melts in a ſmall heat, and aſſumes the fluidity and colour of water; and at the ſame time ariſes in a thin vapour, which being catched in proper veſſels, concretes into a ſolid tranſparent cake, which is the refined camphor of the ſhops. This eaſily takes fire, and burns away without leaving any remains. It readily diſſolves both in expreſſed and diſtilled oils. One ounce of highly rectified ſpirit of wine will take up ſix drams of camphor: if this ſolution be expoſed to the air, the ſpirit flies off, before the camphor begins to exhale: if it be diſtilled, the ſpirit riſes firſt: if ſet on fire, the ſpirit entirely burns away, before the camphor takes flame. Camphor is ſoluble in ſpirit of nitre, but is ſeparated from it upon the addition of water: it likewiſe diſſolves in the vitriolic acid, and ſeems to loſe its ſmell in it; but recovers it, and its priſtine appearance,

IT is anti-peſtilential and procreative, (though ſome have aſſerted the contrary) good againſt fits of the mother, and a great ſmoother and beautifier of the ſkin.

The Oil, or Diſſolution of Camphor.

TAKE of clear white camphor, four ounces; powder it groſly, and put it into a matraſs; pour upon it eight ounces of ſpirit of nitre; ſet it in a very gentle heat of digeſtion, often ſhaking it, and in two or three hours time it will diſſolve into a clear liquor, ſwimming above the ſpirit of nitre, which you may ſeparate as you do other oils. Its uſe is chiefly external. If it be dropped into roſe-water, and with it waſhed from its acrimony, it reaſſumes its body; not being ſubtilized into an eſſential oil, but only diſſolved by ſo much of the nitrous ſpirit as it is capable of receiving; it ſmooths and whitens the ſkin.

Compound Oil of Camphor.

TAKE of the aforeſaid oil, four ounces; of the rectified oil of amber, juniper-berries, oranges, and lemons, ana three ounces; put them into

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pearance, upon the affuſion of water. This ſolution digeſted for ſome time, emits a penetrating vapour, like to that of burning brimſtone. Spirit of ſalt has little or no effect upon camphor: nor do vegetable acids, nor fixed alkaline ſalts, any way act upon it. Diſtilled ſeveral times over from freſh parcels of bole, it aſſumes and retains the appearance of oil.

into a matraſs, and let them ſtand in digeſtion till they are united, which will be in three or four days. But if you will more ſtrictly unite them, put into a large glaſs body, ſo much water, as will fill it two thirds; put to it the compound oil: ſet it in a ſand-furnace, with its head and receiver; give it fire gradually, till the water ſimmers and bubbles; continue the fire till all the oil is diſtilled. If any of the camphor remains coagulated, either in the head or receiver, return it (with all that is diſtilled) into the body again, and diſtill it as before. Repeat this operation two or three times, and the oils and camphor will become inſeparable, and unite into an eſſential oil.

CHAP. XIII.

Of FIXED SALTS[n].

FIXED ſalts are extracted out of the aſhes of woods and plants: for example;

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[n] The fixed ſalts of plants are obtained from their aſhes, by pouring water on them ſo long as it is perceived to gain any taſte, and then evaporating the ſolutions, in proper veſſels, to a dry ſalt. The herb *Kali* being a common material employed for this purpoſe, in ſome countries, has occaſioned theſe ſorts of ſalts, from whatever vegetable procured, to be called *alkaline* ſalts: they appear to be nearly one and the ſame, and not to be diſtinguiſhed from each other, provided they are equally pure, and prepared exactly in the ſame manner. Fixed ſalts are not obtainable in cloſe veſſels: nevertheleſs, vegetables burnt in the open air, ſo as to flame, yield leſs aſhes and ſalt, than if calcined

TAKE of dry wormwood, what quantity you pleaſe : burn it upon a clean hearth ; rake the aſhes ſo long as any fire appears amongſt them ; put

cined with a cloſe, ſmothering heat. Extracts of plants, duly burnt, yield more ſalt than can be obtained from the ſame quantity of the plants themſelves, if calcined immediately without ſuch preparation. If different degrees of heat be employed in the calcination of the vegetable matters, their ſalts acquire different degrees of acrimony : the more vehement and laſting the fire, the more acrid is the ſalt. The different circumſtances of applying the water hot or cold to the aſhes, likewiſe make a notable variation : boiling water takes up more of the earthy and oily parts, than cold water does ; hence the ſalt becomes ſomewhat ſaponaceous and of a brown colour : boiling water likewiſe diſſolves a neutral kind of ſalt, of a quite different nature from fixed alkaline ſalts, though frequently found among the aſhes of vegetables ; while cold water extracts from them only the pure alkaline ſalt, unleſs it be uſed in too large a quantity, or imprudently ſuffered to ſtand too long upon them. All vegetables are not equally fit for yielding theſe ſalts : thus muſtard-ſeed, horſe-radiſh, and the like, yield no fixed ſalt, and very little is obtainable from ſeeds or grain : every vegetable matter, either putrefied or decayed by being long expoſed to the air, is rendered utterly unfit for this purpoſe. Alkaline ſalts, when perfectly pure, are extremely white, but never aſſume the appearance of cryſtals. Expoſed to a moiſt air, they flow per deliquium, as it is called, into a thick unctuous liquor *, and at the ſame time depoſite a conſiderable quantity of earth : the gravity of the liquid is the greateſt of any ſaline fluid, except the vitriolic acid, and is to that of water as 1,550 to 1,000 : if this liquor be inſpiſſated over a ſtrong fire,

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* *One ounce of dry fixed alkaline ſalt, will imbibe from the air near three ounces of water.* Boerh.

put thoſe aſhes into an unglaſed pan, which ſet in a calcining furnace; make fire about it, till the pan is red-hot, where keep it (continually ſtirring the

fire, and the dry matter expoſed again to the air, it will relent as before, and leave behind it more earthy feces: by alternately repeating theſe two proceſſes ſeveral times, a thick ponderous fluid is obtained, which cannot any longer be reduced to a dry form by fire, but either entirely flies away, or penetrates the veſſel which it is expoſed to the fire in. Pure fixed alkaline ſalts eaſily diſſolve in conſiderably leſs than their own weight of cold water. Expoſed to the fire, they melt, and do not ſuffer any conſiderable loſs of parts, unleſs certain neceſſary circumſtances be obſerved, when they are readily diſſipated. Mixed with ſyrup of violets, they change its blue colour into a green; and turn a ſolution of ſublimate into a reddiſh precipitate; the purer the alkali, the brighter and redder is the precipitate. Mixed with acids, they efferveſce, and unite into a liquor which gives no ſigns of an alkaline or acid nature: this liquor duly inſpiſſated, affords cryſtals of different ſhapes and magnitudes, according to the acid employed. Alkaline ſalts, diſſolved in water, and conſidered as menſtruums, diſſolve reſins, reduce animal ſubſtances to a mucilage, concrete with oils and animal fats into ſoaps, and diſſolve ſulphur into a red liquor; eſpecially if mingled with quick-lime, which conſiderably promotes their activity and virtue. Pure alkaline ſalt, melted with ſulphur, diſſolves it into a red fluid, which concretes in the cold into a ſolid maſs, and flows per deliquium in the air. Melted with lead, tin, copper, iron, and regulus of antimony, it corrodes them, ſo as to make them ſomewhat ſoluble in water; but has no effect upon gold or ſilver. It diſſolves ſand, in a great heat, and unites with it into a tranſparent glaſs: if a large quantity of it be melted with a ſmall one of glaſs, ſand, flints, *&c.* it renders them ſoluble in water; from which theſe ſubſtances are again precipitated by the ſlighteſt affuſion of an acid.

Fixed

the aſhes) till they are perfectly calcined into whitiſh grey aſhes, without any blackneſs: then put them into a clean pan, and pour hot water to them: when that water is ſufficiently impregnated with the ſalt, filtre and evaporate to dryneſs, and till the aſhes are left inſipid.

" *The Method of extracting and purifying fixed Alkaline Salts.*

TAKE any quantity of the aſhes of vegetables burnt to a perfect whiteneſs, and which have not been long expoſed to the air: with theſe, almoſt fill a tub, or other convenient veſſel, having a falſe bottom perforated with a great many holes, and covered with a coarſe canvas, or cloth. Pour upon the aſhes ſoft water, till it riſes above their ſurface: let the liquor ſtand four and twenty hours, to extract the ſaline parts; then drain it out through an aperture left for this purpoſe at the bottom of the veſſel. Pour on more water, and let it ſtand as before: repeat this, till the water comes off without any ſaline taſte. Then let all the liquor ſettle, till it is grown perfectly fine; decant it from the feces into a broad, ſhallow iron pan, and evaporate the ſolution till it begins to grow thick, when

Fixed ſalts precipitate ſolutions of metalline and earthy ſubſtances made in acids, and concrete ſo firmly with the vitriolic, marine, and nitrous acids, as not to be ſeparable from them by any degree of fire. Added to ammoniacal ſalts, they lay hold of the acid, and ſet the volatile ſalt at liberty.

when the matter is to be kept continually ſtirring with an iron ſpatula, (to prevent its ſticking to the ſides of the veſſel) till it becomes a dry powder. This may be farther purified, by diſſolving it in twice its weight of water, filtring the ſolution through paper ſupported by a piece of canvas, and then evaporating it to dryneſs with the ſame cautions as before.

Pot-Ashes may be purified in the ſame manner as the ſalt above-mentioned, and then are as fit for any chemical operation."

" *The Method of making Pot-aſhes* [o].

AT one end of a houſe convenient for this purpoſe, place two vats, each of which is to be four foot high, five foot broad, and ſix foot long. Theſe are to be fitted with falſe bottoms, compoſed of ſeveral pieces, and bored full of holes, and placed at a ſmall diſtance above the real bottom of the veſſel. Make a hole in the ſide of each of theſe vats, between the two bottoms, which is to be occaſionally ſtopt with a plug. Sink two other vats, of the ſame width and breadth with the former, but only three foot and a half deep; in ſuch a manner, that the holes in the upper vats may command theſe. Cover the

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[o] Pot-aſhes are made in different manners, and of different materials in ſeveral countries: the above way of making them in our own was communicated to me by an artiſt expert in this affair.

falſe bottoms of the upper veſſels with wheat ſtraw, to the depth of one inch: upon this the aſhes are to be diligently trod in, till they ariſe within four inches of the top. Fill one of them with ſoft water; let it remain on the aſhes for three or four days; then let it drain off into the receiver. This lye is to be put on the freſh aſhes in the other vat, and left to ſtand as before; at the ſame time, the firſt veſſel is to be filled with water afreſh, in order to extract the remaining part of the ſalt. When, by a mixture of the weaker lye with the ſtronger, you have brought the lye to be twelve cadukes or carrats [p] ſtrong, it is fit for ſoaking your ſtraw in [q]: in one hour's time, the ſtraw (which is to be put into the lye in the lowermoſt vats) will be ſufficiently ſoaked, when it is to be taken out, and laid upon boards ſo placed, as to convey the liquor which drains from it, back into the lower, or ſoaking vats. You muſt put freſh ſtraw into the remaining lye, and repeat this untill it is all taken up. As ſoon as the ſtraw is become ſo dry as to ceaſe dripping, it is to be burnt in a large chimney. Make a cavity in the hearth about ſix inches deep, and cover over its bottom evenly with dry aſhes to half an inch depth, and tread them ſmooth and cloſe; then ſpread a little dry ſtraw upon it, and ſet it on fire; and gradually ſcatter on the prepared ſtraw, ſo as to keep it continually burning: when it is all burnt, the pot-aſh will be found in a ſolid lump: break it to pieces with an iron crow, or ſuch like inſtrument, and pack it up cloſe in caſks for uſe.

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[p] A *caduke*, or *carrat*, is one ſixteenth part of the weight of any quantity of a ſtrong and fully ſaturated lye. In order to know the ſtrength of your liquor, diſſolve as much potaſh, or any other fixed alkaline ſalt, in water, as it will take up: With this, fill a bottle, or other convenient glaſs, and weigh it; divide the weight (ſubtracting the weight of the bottle) into ſixteen parts, each of which will be equal to one caduke. Empty the bottle, and fill it with the liquor to be examined, and ſo many cadukes as it weighs, ſo many cadukes ſtrong the lye is.

[q] Inſtead of wheat or barley ſtraw, you may uſe peaſe, or bean ſtraw, fern, furze, heath, or any other porous fuel that will burn to a white aſh: Boughs of elder are judged excellent for this purpoſe.

FIFTEEN quarters of aſhes [r] (which quantity your vats will contain at once) will produce about ſeven hundred weight of pot-aſhes."

CHAP. XIV.

Of WINE.

WINE is made of the expreſſed juice of the grape, which immediately after the preſſure is called muſt, and being fermented, becomes

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[r] The aſhes ſhould be kept dry, or they will be unfit for this purpoſe. The wood aſhes from brick kilns, and ſuch like places, are excellent; for ſtifling the ſmoke increaſes the quantity of ſalt in the aſhes.

comes wine [s]. The fermentation cauſes a ſeparation of the groſs tartar, and the viſcous part of the muſt from the pure ſulphureous and oily ones, in which

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[s] The difference of flavour, taſte, colour, body, in wines, is perhaps as much owing to the different manner and time of preſſing, gathering, fermenting, &c. the grape, as to any difference in the grape itſelf. In *Hungary*, whence Tockay, and ſome of the richeſt and higheſt-flavoured wines come, they are extremely curious in theſe reſpects: For their prime and moſt delicate wines, the grape is ſuffered to continue upon the vine, till it is half dryed by the heat of the ſun; and if the ſun's heat ſhould not prove ſufficient, they are dried by the gentle heat of a furnace, and then picked one by one from the ſtalks. The juice of this grape, when preſſed out, is of a fine flavour, and ſweet as ſugar: this, after due fermentation, is kept for a year, and then racked from the lees, when it proves a generous, oily, rich wine, and is ſold at a very high rate. The *Hungarians* prepare a ſecond ſort of wine, by collecting together the better kind of grapes, carefully picking the fruit from the ſtalks, and then preſſing out the juice: this is extremely ſweet, and is made richer by infuſing in it, after it has fermented for ſome days, a ſufficient quantity of half dried grapes. This wine is very ſweet, oily, of a grateful taſte, and retains theſe qualities for a long time. There is a third ſort made from the pure juice of the ſame kind of grape, without any addition. This is a more briſk and lively wine, and far leſs ſweet. They likewiſe prepare a fourth ſort, from grapes of different goodneſs mixed together: this, though not ſo generous, is nevertheleſs an excellent wine. Theſe *Hungarian* wines are remarkable for preſerving their ſweetneſs, and for the delicacy of their taſte and ſmell: they likewiſe do not grow eaſily vapid, and may be kept in perfection for many years.

The practice of the *Hungarians*, which we have extracted from *Hoffman*'s obſervations, fairly points out a method of improving which are the ſpirit and eſſential ſalt. The ſolid part of the tartar adheres to the ſides of the veſſel, and the viſcous falls to the bottom.

The ſharp ſprightly wines, *Champaigne*, *Burgundy*, *Nants*, *Bourdeaux*, &c. being moſt impregnated with eſſential ſalt, yield more ſpirit than ſweet *Spaniſh* and muſcate wines; becauſe they are more loaded with a viſcous ſubſtance[t].

ſing muſt, or the juice of the grape, ſo as to make it of any aſſignable degree of richneſs and ſtrength; and the celebrated Dr. *Stahl* has given us another method of improving poor, thin wines, ſo as to make them ſtrong and full-bodied, without any ways altering their natural flavour or taſte. This he effects by expoſing a quantity of the liquor in proper veſſels, to the action of a cold, freezing air, which ſoon congealing the watery parts alone, ſuffers the richer to be poured from them. By this means, I have made the product of our own country, cider, of ſuch a degree of ſtrength and richneſs, as to equal, if not exceed, the ſtrongeſt bodied wines, and to ſtand the alternatives of the winter's cold, and the ſummer's ſun without alteration: and, if as much care was taken in the culture, choice and management of the fruit, and particularly in the preſſure, and ſlow, wary fermentation, of the juice; there is good reaſon to expect, that the flavour and taſte would not fall far ſhort even of the more excellent wines. See *Stahlii Zymotechn. fund. Opuſc. phyſico-med. Schediaſma commendans concentrationem vini aliorumque*, and Dr. *Shaw*'s Comment on this Tract, in his *IIId Eſſay in Artificial Philoſophy*. *Miller*'s Gardeners Dictionary.

[t] The principles of wines are, an inflammable ſpirit, a phlegm or watery liquor, an acid ſalt or tartar, and a ſulphureous oily ſubſtance. Wines, therefore, greatly differ in their taſte, ſmell, and virtue, according to the various proportions and manner in which

Spirit of Wine, or Brandy,

FILL a copper-ſtill (which hath a refrigeratory) two thirds full of *French* wine[u]; lute on the head, and put a receiver to the noſe of the
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which theſe principles are combined. There is in ſome wines another principle, which is a ſoft, oily, mild, viſcid, ſweet ſubſtance, and is particularly obſervable in ſack, *Frontiniac*, and the more generous kinds of *Hungarian* wine. The ſulphureous, oily principle, is more ſubtile and grateful in ſome wines, than in others : thus *Rheniſh* and *Hungarian* wines yield a far more delicate and ſubtile ſpirit, than thoſe of *France* and *Miſnia :* the very ſmell of good old *Rheniſh* wine has a remarkable effect in refreſhing the ſpirits. Nor is the acid principle, or tartar, leſs different in wines : ſome abound with it ; while others have it more ſparingly, but of a more ſubtile kind, as *Rheniſh* wines : the tartar of ſome wines, particularly that of *Moſelle*, has a bitteriſh, nitrous taſte ; whence they are held to be laxative and diuretic.

A good deal of circumſpection is neceſſary to analyſe wines, and the diſtillation ſhould be ſet about in a workman-like manner. Three pounds of the beſt *Rheniſh* wine, diſtilled in a glaſs cucurbit, yielded upwards of ſix ounces of ſpirit. The ſame quantity of *French* wine gave four ounces. One pound and three quarters of ſtrong *Hungarian* yielded near ſix ounces. One pound and ſix ounces of *Burgundy* gave four ounces. From theſe experiments it appears, that *Hungarian* wine is more ſpirituous than *Burgundy*, *Burgundy* than *Rheniſh*, and that than *French*. — The remains of all theſe wines after the ſpirit is come over, are of a deeper colour than before, and of an acid taſte : but in this reſpect, the wines remarkably differ from each other ; the remainder of the *Hungarian* is of an acid taſte, with ſome degree of ſweetneſs ; that of the *Burgundy*, of a rough acid ; the
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the worm; give a gradual fire, till the ſpirit runs in a ſmall thread; keep it in that degree, till that which comes over, being thrown into the fire with a ſpoon, will not burn: then let all cool, and remove the receiver, which contains the weak ſpirit of wine, or brandy, *&c.*

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old *Rheniſh* ſharper than this; and the *French*, ſharpeſt of them all. Upon pouring the ſpirit of *Rheniſh* wine back upon what remains in the cucurbit, the acidity is much broke and rendered ſofter; but this does not reſtore the peculiar flavour of the wine.

Red wines receive their colour from the ſkins of the grape, and this in proportion to the time they are allowed to ſtand upon them. This circumſtance contributes likewiſe to their roughneſs or aſtringency, which they extract not only from the ſkin, but likewiſe from the ſtones. The colour of red wines is changed, by the affuſion of an alkaline lixivium, into a brown; at the ſame time, the mixture grows turbid, and ſoon depoſites a conſiderable ſediment. Wines of a golden or yellow colour, grow deeper upon being mixed with alkaline ſalts: ſuch as are of an acid nature effervеſce therewith, and form a neutral ſalt. *Rheniſh* wines may, by this means, be eaſily rendered an elegant and uſeful medicine. If the reader deſires further ſatisfaction on this head, he may conſult *Hoffman*'s *Obſervationes phyſico-chymicæ.*

[u] *French* wine is too dear an article in this country, to be employed in diſtillation: nor is the ſpirit obtainable from it any ways preferable to one procurable from cheaper liquors. Melaſſes, coarſe ſugars, or (what is better, and will in the end turn out cheaper,) a dry, grained ſugar, diſſolved in ſeven or eight times its weight of water, ſlowly fermented with the aſſiſtance of a little well-flavoured ale yeaſt, till it has quite loſt its ſweet taſte, and then warily diſtilled, in a workman-like manner, will yield a ſpirit almoſt flavourleſs and taſteleſs, e-

Rectified Spirit of Wine.

PUT into a long-bodied matraſs [w], ſo much of the foregoing vinous ſpirit, as will fill one half of it; place it in a gentle heat of ſand, and draw off one half, or till you ſee the ſmall veins expand themſelves to twice the breadth they at firſt appeared of: then remove the receiver, and you will have a ſpirit which will burn away to a drop or two, if a ſpoonful be ſet on fire, by the flame of paper or candle.

THIS

ſpecially if it be carefully rectified in a water-bath. — As for wines, thoſe which are made about *Orleans* and *Paris*, yield a greater plenty of ſpirit, than the *Spaniſh* and *Muſcate* wines, and many others which ſeem to be ſtronger.

[w] This method of rectifying ſpirit of wine in glaſs veſſels, is attended with too much expence, and too hazardous and troubleſome an apparatus, to anſwer any uſeful purpoſes: and, although I agree with Mr. *Lemery*, in condemning the tall ſerpentine tube, and other complex metallic veſſels contrived for dephlegming inflammable ſpirits, as being rather pompous than uſeful; yet they appear liable to objection upon a more material account, as being built upon wrong principles: for, if the vinous liquor be made to boil, (which point of heat is abſolutely neceſſary to make the diſtillation ſucceed in theſe kinds of veſſels) a conſiderable quantity of mere phlegm will be elevated along with the ſpirit. In the plates of inſtruments, there is a draught of a copper adopter, which being placed between the ſmall-ſtill and its head, makes a ſimple and convenient apparatus for this purpoſe. The rule to be obſerved in uſing this inſtrument is, that the taller the adopter, and the gentler the heat applied, the leſs phlegm will the diſtilled ſpirit have.

This ſpirit ſerves for making ſeveral extracts and tinctures.

But if you will have yet a more high and perfect ſpirit of wine, put what quantity you pleaſe of the foregoing ſpirit into a veſſel; and to each gallon, four pounds of calcined tartar, or the ſame quantity of pot-aſhes, in powder, and very dry; ſhake them well, and let them ſtand a quarter of an hour; repeat the agitation two or three times, that the ſalt may imbibe the phlegm: when it is well ſettled, decant the ſpirit into a long body, in the mouth of which hang a clean cloth, which contains in it one pound of ſalt of tartar, proportionally to each gallon [x]: place your matraſs, or body, in a gentle heat of ſand; and the ſpirit of wine which diſtills into the receiver, will be perfect; the ſalt receiving and keeping back the phlegm.

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[x] If your ſpirit be any thing ſtrong, the calcined tartar, or pot-aſhes, is ordered in too large a proportion; and it is a needleſs trouble to ſuſpend any ſalt of tartar in the mouth of the veſſel. The ſtrength of ſpirits is beſt determined by weight; and the hydrometer, as improved by Mr. *Clarke*, is a well-contrived inſtrument for this purpoſe. It is ſufficient to add ſomewhat leſs than twice as much well-dryed pot-aſhes in powder, as you ſuſpect there is phlegm contained in the ſpirit; and then to ſtir the mixture well together every now and then, letting the ſpirit ſtand upon the ſalt for at leaſt twelve hours. If the ſaline taſte and acrimony, which ſpirits gain from fixed alkaline ſalts, eſpecially when highly calcined, or if the ſpirits be drawn off from them by diſtillation, be thought inconvenient; the addition of a few drops of ſtrong ſpirit of nitre will entirely take it off.

THIS ſpirit is fit for any uſe in chemiſtry, as a menſtruum, or for extracting tinctures, *&c.* It is ſometimes taken inwardly, to the quantity of half or three quarters of a ſpoonful, by apoplectical perſons; and is externally uſed in burns, alſo in cold pains and contuſions, *&c.*

IF you have a great quantity to rectify, you may put ſeveral parcels to work in a digeſting furnace, in five or ſix veſſels, and you may have of pure rectified ſpirit two or three gallons in twenty-four hours time: or it may alſo be rectified in a copper ſtill, with its refrigeratory.

Spirit of Wine tartarized.

TAKE ſalt of tartar, two or three times coagulated and diſſolved, one pound; give it a ſtrong fuſion in a crucible, for two hours [y]; powder it in a warm mortar, and whilſt warm, put it into a matraſs, to two quarts of the former rectified ſpirit of wine; ſhake them well together, and place them in a ſand-furnace; lute the junctures of the head and receiver; give fire to ſuch a degree, as may make the drops ſucceed each other very quickly. This ſpirit of wine volatilizes, and carries over with it ſome part of the ſalt of tartar, which is demonſtrable, by the ſalt ſuſtaining the loſs of at leaſt one ounce [z] of its weight.

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[y] Mr. *Lemery*, from whom this proceſs ſeems to be taken, employs the ſalt of tartar as commonly prepared; and indeed the troubleſome purification, and long fuſion, here ordered, appear to be needleſs; for it is ſufficient that the ſalt be throughly dried, and finely powdered, and that the diſtillation be performed as quick as poſſible, to elevate with the ſpirit a conſiderable portion of the ſalt. This circumſtance is neglected by *Lemery*, but pointed out in the proceſs above. Glaſs veſſels are very inconvenient inſtruments for this operation, which may be performed with greater advantage both to the operator and the preparation itſelf, in the ſmall copper ſtill placed in the mouth of a larger one, with its head (which ought to be of fine pewter) luted to the worm fixed in the refrigeratory. See a draught of this apparatus in the plates of inſtruments.

By this operation, the ſpirit of wine acquires a more agreeable ſcent and taſte than before, and it is more ſubtile, and given in a leſs doſe, and for the ſame uſe as the former.

If you let the ſpirit ſtand thirty or forty hours upon the ſalt of tartar in digeſtion, before you begin the diſtillation, it will the better imbibe the more ſubtile part of the ſalt.

Spirit of Wine tartarized another Way.

TAKE the ſalt of tartar left in the bottom of the matraſs, in the foregoing operation; diſſolve it in pure rectified diſtilled vinegar; filtre the diſſolution, and coagulate the ſalt, which diſſolve again in more diſtilled vinegar: filtre and coagulate as before. Repeat this operation ſo often, that no black feces remain, and that the diſtilled vinegar comes off as ſtrong as it was put upon the ſalt: then is this ſalt prepared, which ſome call (but not truly) by the name of volatile ſalt of tartar.

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[z] Mr. *Lemery* ſays he gained an ounce and a half. The quantity of ſalt will, in all probability be in proportion to the diſpatch with which the diſtillation is performed. It is ſurpriſing therefore, that the above-mentioned author ſhould direct a gradual fire, and the diſtillation to be continued no longer than till three fourths of the ſpirit are come over.

IF you will farther exalt this ſalt, take of the foregoing ſalt of tartar, four ounces; and put to it one pound of the ſpirit of wine, which will readily diſſolve it. Let the diſſolution ſtand quiet three or four hours, and decant it gently from the feces; draw off the ſpirit of wine in a gentle heat of ſand in a retort; diſſolve the ſalt again in the ſame ſpirit of wine, and repeat the operation till no feces remain: return the ſalt again into the ſpirit of wine, in which it will totally diſſolve.

THIS is the true tartarized ſpirit of wine, with which I extract the tinctures and anodyne ſulphurs of metals, and unite them with vegetable fixed, and animal volatile alkalies; which is one of the chief ingredients in the compoſition of that excellent anti-rheumatic tincture, which fifteen or ſixteen years ago, cured me of a violent rheumatiſm, that afflicted me three years ſucceſſively: and I was not only freed then from thoſe acute pains which attended the diſtemper, but have been preſerved to this day without the leaſt ſymptom of them. Nor are its virtues confined to the cure of that diſeaſe only, but even to the gout, ſcurvy, dropſy, jaundice, colic, green-ſickneſs, ſtone and gravel in the bladder or kidneys, and ſevers: in all theſe diſtempers it has manifeſted its virtues, and given relief to ſome hundreds, within theſe thirteen years laſt paſt.

THIS tartarized ſpirit of wine is cathartic, diuretic, and diaphoretic. Its doſe is from fifty drops to two drams, in wine and water, or water alone.

THE diſtilled vinegar you uſe in this operation ought to be rectified ſo often, till it leaves nothing in the bottom of the veſſel, in which it is rectified, but a little white ſalt.

The Cephalic, or Head Spirit.

TAKE of the eſſential oils of cloves, cinnamon, and nutmegs, of each half a dram; of thoſe of marjoram, lavender, and roſemary, of each two ſcruples; thoſe of oranges and lemons, ana one ſcruple and a half; of fine benjamin in powder, one ounce: mix theſe all together, with three pints of tartarized ſpirit of wine, in a cucurbit; which place in a ſand furnace, and fit and lute on the head and receiver: kindle the fire, which gradually increaſe to the ſecond degree, and in that heat continue it, till three pints are drawn off. Then take off the receiver, and put the ſpirit in a clean matraſs, to which, put of marum ſyriacum, and lillies of the valley, ana one ounce; of ſal volatile oleoſum, two ounces; and of eſſence of ambergreaſe, one dram and a half: ſhake them well, and invert a blind-head to the matraſs, and keep it in a gentle heat of digeſtion three or four days, and then put the ſpirit into a vial, well ſtopped, for uſe [a].

THIS ſpirit is a moſt pleaſant and excellent cephalic; three or four drops of it being ſtrongly ſnuffed up the noſtrils, and the temples a little rubbed with it, immediately remove moſt pains of the head: it may alſo be taken from ten to thirty or forty drops, in a little glaſs of wine or water, and is a moſt effectual pectoral medicine. This is that true ſpiritus cephalicus which I have made above thirty years, and has by ſeveral perſons of late years been counterfeited, and called by the name of liquid ſnuff.

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[a] There ſeems to be no occaſion for the diſtillation in this proceſs: the eſſential oils may be as well dropt in, after the ſpirit has ſtood ſome time upon the other ingredients. The digeſtion is likewiſe rather inconvenient than of any ſervice. The following alteration of the whole is ſubmitted to the reader. — Take of marum ſyriacum, and ſpirit of volatile oily ſalt, of each two ounces, tartariſed ſpirit of wine three pints. Let theſe ſtand in a cloſe veſſel, in the cold, for four and twenty hours; then filter the tincture, and add to it of oil of lavender two drams, oil of lemons and pimento, ana one dram.

In this operation, exceed not the ſecond degree of fire, nor draw off above three parts of ſpirit, before you take off the receiver from the retort; which you may do while the fire is ſtill under it: then put the receiver on again, and without ſupplying the fire any more, let what will come off, till all is cold, which will be about a pint more, and is a pretty water to waſh your fingers and mouth after meals.

Spirit of Scurvy-Graſs.

TAKE of garden ſcurvy-graſs in flower, (or freſh and newly gathered, at any other time) twenty pounds; bruiſe it groſsly, and put it into a copper-ſtill, tinned within; put to it three gallons of the grounds of ale, with a pint of new yeaſt; ſtir them well together, lute on the head, and kindle a little ſmall-coal under it, to give juſt a fermenting warmth: let it ſtand twenty-four hours; and then give fire to diſtill the ſpirit. That which comes firſt is the beſt, and ought to be kept by itſelf: the ſecond running will ſerve to put to more graſs, when you diſtill it another time.

It is alſo made without fermentation, with ſpirit of wine, thus: to twenty pounds of ſcurvy-graſs, bruiſed as before, put two gallons of brandy, or diſtillers proof-ſpirit; diſtil one gallon, which will be ſtrongly impregnated with the virtue of the herb. The ſecond running you may keep for the ſame uſe as before: ſome add to every ten pounds of graſs, two pounds of horſe-radiſh, ſliced or bruiſed, *&c.*

THE purging ſpirit is made by diſſolving one ounce of reſin of ſcammony, or jalap, in one pound of the ſpirit.

THE doſe of the plain ſpirit is from twenty to an hundred drops; and of the purging ſpirit, from twenty to ſixty drops.

The Queen of Hungary's *Water.*

TAKE of the tops of roſemary, when full of flowers, what quantity you pleaſe; put them into a copper-ſtill, tinned within; pour upon them three times their weight of rectified ſpirit of wine, with as much clean water: lute on the head, fit a receiver to the worm, and make a little fire of ſmall-coal, but not ſo hot as to elevate any ſpirit: and thus let it ſtand twenty-four hours: then give a fire to make the liquor diſtill in a ſmall thread, and draw off all the ſpirit, and half the water: then let out the fire, and take the roſemary tops out of the ſtill, and put one third part of the quantity of flowers, to thoſe already in the ſtill. Return all the former diſtillation upon the flowers; lute on the head, digeſt as before, and draw off by gentle fire, the ſame quantity of ſpirit of wine which at firſt you put on; which keep cloſe ſtopped for uſe [b].

THE operation of this ſpirit is diaphoretic: it is given in convulſions, cramps, palſies, lethargies, apoplexies, and hyſterical maladies. Its doſe is from one dram to two or three, in a proper vehicle.

AFTER the ſame method in which the two foregoing ſpirits are made, you may make the ſpirits of all herbs and flowers, *&c.* adding ſo much water as is ſufficient to keep them from burning.

To make Cordial Waters.

TAKE of dried orange-peel, two pounds; of the tops of clary, (in flower) two handfuls;

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[b] The diſtillation of *Hungary-water* is moſt conveniently performed in *balneo mariæ*, to prevent the neceſſity of putting water to the flowers, which ſtrangely abates their native flavour and volatility. The ſpirit employed for this purpoſe, ſhould be as pure, and free from any diſagreeable flavour, as poſſible: To be certain of this, lower a little of it with three or four times its quantity of fair water; if the ſpirit by this means betrays any ill ſmell, or turns whitiſh or bluiſh, it is not fit for this uſe. Two or three pounds of tops of roſemary ſhould be allowed to one gallon of ſpirit: they ſhould be freſh gathered, in a dry ſeaſon, not at all preſſed or bruiſed, full of flower, well blown, and very fragrant. If you deſire to have this water highly odoriferous, and in great perfection, you muſt not only obſerve the above circumſtances with regard to the choice of the flowers and ſpirit, but the diſtillation muſt be ſlow and equal, not at all hurried; and you muſt not draw off all the ſpirit put on, or elſe reſerve the laſt runnings (about one ſixth part of the whole quantity) by themſelves, for inferior purpoſes.

of *French* brandy, four gallons; of ſpring-water, three gallons: put them into a copper alembic, and draw off three gallons and a half of ſpirit; then change the receiver, and draw off one gallon more; in which diſſolve four pounds of fine ſugar, and mix it with the firſt drawn, and clarify all with the whites off eggs[c].

AFTER this manner you may make cinnamon-water, *&c*: If you would draw ſpirit of ſaffron, you cannot allow leſs than two ounces of ſaffron to each gallon of brandy.

CHAP. XV.

Of VINEGAR.

WINE becomes eager by a ſecond fermentation; for that cauſeth the loſs of ſome of its moſt ſubtile ſulphureous ſpirits, by which debilitation, the acid ſalts predominate, and fix the reſt of the ſpirits remaining in the wine[d].

Diſtillation

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[c] Inſtead of four gallons of *French* brandy, put five gallons of clean, well-taſted proof ſpirit, without any water, and draw off as much as will ariſe in the heat of a balneum. To this ſpirit, which will be clear and limpid, gradually add, by little quantities at a time, pure ſoft water, till the mixture begins to grow milky, when you may put in the quantity of ſugar above ordered. In a few hours ſtanding, the ſpirit will grow bright and tranſparent, and prove a far more agreeable cordial than when made according to the directions above, which are more troubleſome.

[d] Vinegar is not produced from wine by the loſs of its inflammable ſpirit, but by a new change in the whole compoſi-

tion,

Diſtillation of Vinegar.

PUT of good wine-vinegar into a large retort, or body fitted with a head, what quantity you pleaſe, ſo that one third part remain emp-

tion, effected by a higher degree of fermentation than is neceſſary to produce wine: this degree of fermentation is always accompanied with a ſenſible warmth. The ſtronger and more ſpirituous the vinous liquor is, the better and ſtronger vinegar will it yield. Wines, upon loſing their ſpirit, are changed into vapid liquors, which do not at all reſemble vinegar. Vinegar, upon being diſtilled with gradual degrees of fire, yields, at firſt, a conſiderable deal of phlegm, which at length becomes ſlightly acid: upon cautiouſly increaſing the fire, a truly acid liquor comes over, of no diſagreeable ſmell; at length a more ponderous acid, with a dark-coloured oil, ſmelling ſtrong of an empyreuma: a black, acid caput mortuum remains at the bottom of the diſtilling veſſel, which being burnt in the open air, yields a large portion of fixed alkaline ſalt to water. The acid parts in vinegar, according to Mr. *Homberg*, bear but little proportion to the reſt of the liquor, thirty-ſix parts out of thirty-ſeven being a mere aqueous fluid. A kind of vinegar is ſaid to be artificially produced, by infuſing ſhavings of fir-wood in water, which is probably promoted by the addition of certain ſaline matters. This proceſs is not at all improbable, ſince woods, upon diſtillation, yield an acid liquor; and ſince it is well known, that the water which comes over in the diſtillation of turpentine, along with its oil, is very ſenſibly acid, and, in ſome reſpects, not greatly different from diſtilled vinegar. There likewiſe comes over in the diſtillation of vinous liquors, particularly of ſuch as have undergone a complete degree of vinous fermentation, a volatile acid liquor; which, with regard to ſome ſubſtances, is a powerful and agreeable ty [e]; place it in a ſand-furnace, and with a fire of the firſt degree, draw off a fifth part, which keep by itſelf, for it will ſerve for ſome uſes; then increaſe

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diſſolvent. If a proper quantity of common tartar in powder, be diſſolved in the melaſſes of the ſugar bakers, previouſly diluted with a ſuitable portion of fair water, it becomes a liquor well adapted for vinous or acetous fermentation, and may be ſo managed, as to prove a not unpleaſant wine, or an excellent vinegar. Vinegar, conſidered as a menſtruum, diſſolves chalk, ſtony matters which become lime upon being calcined, either burnt or unburnt, into a clear, and, to appearance, homogeneous fluid. Vinegar diſſolves copper, lead, zink, and iron, but does not act upon gold or ſilver, or the harder kinds of ſtones.

[e] Wine-vinegar is more proper for diſtillation than beer-vinegar; for the latter, however acid and fine, contains a large portion of a viſcous, mucilaginous ſubſtance, as is evident from the ſlimineſs and ropineſs to which this kind of vinegar is very much ſubject: this not only hinders the acid parts from ariſing freely, but is likewiſe very apt to make the vinegar boil over into the recipient, and at the ſame time ſubjects it to receive a diſagreeable impreſſion from the fire: and indeed it is extremely difficult to avoid an empyreuma, even with the beſt kind of vinegar, if the diſtillation be continued to any great length. The beſt method of preventing this inconvenience is, if a retort be made uſe of, not to place the ſand too high up its ſides; and, when ſomewhat more than half the vinegar is come over, to pour to the remainder a quantity of freſh vinegar, made hot, equal to that of the liquor drawn off: this may be repeated three or four times. If the common ſtill be employed for this purpoſe, the head ſhould be made of pure tin, and freſh vinegar be frequently added, in proportion as the diſtilled liquor runs off; otherwiſe an empyreuma is unavoidable.——*Vigani* (in his *Medulla Chymiæ*, p. 13.) makes mention of a ſubtile ſpirit,

creaſe the fire to the ſecond degree, and ſo continue till all is diſtilled, except a ſmall quantity left in the bottom of the veſſel, of the conſiſtence of honey. When all is cold, take off the receiver, and if you would rectify the ſpirit, put it into a clean veſſel; ſet it in the ſame degree of fire, to ſeparate more phlegm, and in every thing proceed as before, till you come almoſt to a dry bottom; which, however, muſt not be urged too far, for fear it ſhould give an empyreuma to that which is already diſtilled.

Its chief uſe is for the diſſolutions and precipitations of ſeveral bodies.

The concentrated Spirit of Vinegar.

PUT as much diſtilled vinegar upon filings of copper, or the ſcoria which the braſiers call ſpittle-duſt, as will cover it: let the mixture ſtand together for ſome time, that the vinegar may penetrate the copper: then expoſe the whole to a gentle heat, till the phlegmy parts are evaporated, and a ſtrong ſmell of vinegar is perceived, when it is to be removed from the fire, and impregnated

with

ſpirit, which, he ſays, ariſes at the beginning of the diſtillation of vinegar, before the phlegm, and uſually eſcapes the artiſt through its great degree of ſubtility. *Boerhaave* (*El. Chem proc.* 51.) ſuppoſes, that this liquor was a truly inflammable ſpirit of wine, which may very well be ſuppoſed to ariſe, if the former made uſe of new vinegar, as the latter, I think with a great degree of probability, imagines.

with vinegar afreſh: this proceſs is to be repeated ſo often, till you perceive an eager ſcent at the beginning of the evaporation, which ſignifies the copper is ſatiated with the diſtilled vinegar: put this ſatiated calx into a retort, place it in a ſand-furnace, fit to it a receiver, and lute well the joint with a wet bladder; give the firſt degree of fire for two hours; then increaſe it to the ſecond two or three hours more; and ſo to the third three hours longer; at laſt give it the fourth degree for two hours more: then let all cool, and in the receiver you will have a concentrated vinegar, which is called ſpirit of vinegar. You may ſtill ſeparate the more phlegmatic part by rectification. It has all the properties of diſtilled vinegar, but will perform any operation with more force, and in much leſs quantity.

THE ſame copper will ſerve ſeveral times for the concentration of more diſtilled vinegar.

"*The concentrated Spirit of Vinegar, another Way.*

TAKE a gallon of ſharp vinegar, and put it into a receiver capable of holding four times the quantity. Gradually add to this, by little and little, ſtirring the liquor well every time, about a twentieth part of the weight of the vinegar, if the vinegar is very ſtrong, of pure, dry, fixed alkaline ſalt; an effervefcence will ariſe upon every addition,

tion, and grow ſtronger each time, till the vinegar is ſatiated, when it will entirely ceaſe [f]. When this happens, pour the mixture into a broad iron pan: evaporate it over a ſlow fire, with a gentle and equable heat, (ſtirring it with a ſpatula when the liquor begins to grow thick) untill a dry, ſaline matter remains at the bottom, which is immediately to be taken out, and kept in a veſſel cloſe ſtopt from the air: Put this into a retort, and add to it a ſubduple quantity of its weight of oil of vitriol well rectified, and perfectly freed from its volatile ſpirit: lute on a receiver, and apply a very gradual fire, till no more liquor is perceived to come over. The ſpirit ſhould be cautiouſly poured out of the receiver into a bottle; for it is extremely volatile, and highly acid."

CHAP. XVI.

Of TARTAR.

IT is the eſſential ſalt of wine, which after fermentation ſeparates and adheres to the ſides of the caſks. It is red and white; the white contains leſs earth than the red; and is therefore preferable to the red; the beſt white tartar, is that of Rheniſh wine, which comes from *Germany*. The lees of wine alſo contain much tartar, which being dried

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[f] There is no need of being very ſcrupulous in hitting the exact point of ſaturation betwixt the vinegar and the alkaline ſalt: it is better to let the firſt prevail.

dried and calcined, are called cineres clavellati; out of which, a ſalt of tartar may be extracted [g].

Cryſtals,

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[g] Tartar is the eſſential ſalt of wine, or of the juice of the grape, thrown off to the ſides of the containing veſſel, after it has undergone a complete vinous fermentation. It is of two different colours, white and red, according to the wine which it is obtained from. This ſubſtance diſappears, or is taken up by the liquor, if the fermentation is ſo increaſed, as to change the wine into vinegar. The red ſort of tartar is generally looked upon as leſs pure, and more terreſtrial, than the white: but, of either ſort, ſuch as is clean, ſolid, ſomewhat tranſparent, with its outſide covered over with ſhining cryſtals, is preferable to ſuch as is porous, opaque, droſſy, and leſs bright. Cold water ſcarcely acts at all upon tartar: half an ounce of the cryſtals, or cream, requires twelve ounces of boiling water to diſſolve in; but, if the tartar be reduced to a fine powder, the ſame quantity of water, while boiling, may be made to take up ſeven drams; but in proportion as the menſtruum grows cold, it depoſites the whole. The ſolutions of both the tartars paſs the filtre colourleſs, and ſhoot into white ſemi-tranſparent cryſtals. Certain earthy matters have powerful effects upon tartar, all the earths which are ſoluble in vinegar, rendering it more readily ſoluble in water; hence the refiners of tartar are ſaid to make uſe of a ſaponaceous earth, to promote its ſolution. Tartar, boiled with repeated additions of well concentrated lime-water, at length efferveſces with it, and diſſolves in conſiderable quantity, three pounds of the menſtruum taking up a pound and a half of tartar: the ſolution being filtred, and, after due evaporation, ſet to ſhoot, yields cryſtals which give ſome marks of an alkaline nature, but on repeating the ſolution and cryſtallization, appear neither acid nor alkaline: their figure is that of ſquare priſms, terminated by two flat ſurfaces. A pound and a half of powdered chalk, boiled and well mixed with water, diſſolves a pound of cream

of

Cryſtals, or Cream of Tartar.

TAKE of crude tartar, what quantity you pleaſe; boil it in water, till the parts which are capable of diſſolution, be entirely diſſolved: run the liquor, whilſt it is hot, through a flannel-bag into an earthen-pan, and evaporate till a pellicle

of tartar, ſo as to paſs almoſt entirely through a filtre: the ſolution treated as the foregoing, yields cryſtals of the ſame kind. Fixed alkaline ſalts are powerful diſſolvents of tartar: a pound of fixed alkali, if exceeding ſtrong and pure, will diſſolve almoſt three times its weight of clean tartar. The anomalous ſalt borax has a very extraordinary effect upon tartar: two ounces of borax, and four ounces of cream of tartar, diſſolve quietly in twelve ounces of boiling water; the ſalts, on evaporation, concrete into a tranſparent ſubſtance reſembling gum, of an acid taſte; this gummy maſs ſlowly relents in the air. Tartar, expoſed to the fire in cloſe veſſels, yields firſt an aqueous liquor, then a weak acid liquor, which is followed by a dark-coloured empyreumatic oil; what remains is a ſpongy, light, black coal, which, being expoſed to the action both of fire and air, is ſoon converted into whitiſh ſaline aſhes, which, upon elixation, yield a large portion of fixed alkaline ſalt. Tartar, boiled in water, diſſolves iron; and, with the addition of common ſalt, copper. Tartar and nitre, mixed together in equal quantities, and injected into a red hot ladle, deflagrate, and are changed into a white, imperfect alkaline ſalt, which is about half the weight of the two: if the quantity of tartar be double to that of the nitre, the mixture becomes a blackiſh maſs, of an alkaline nature, but ſtill containing a large portion of oil: this eaſily melts. It likewiſe promotes the fuſion of metals, and prevents them from being calcined or deſtroyed by the action of the fire.

licle appears: then ſet it in a cold place, and ſuffer it to ſtand quiet two or three days; afterwards, decant the liquor, and you will find the cryſtals adhere to the ſides of the pan; ſcrape them off, and evaporate the reſt of the liquor as before, and ſet it again to ſhoot into cryſtals: repeat the evaporation, till all the cryſtals are ſhot.

ITS operation is cathartic and diuretic. The doſe is from half a dram to one ounce.

IF you dry the crude tartar in an oven, till it is a little ſcorched (not calcined) to evaporate ſome of its acid particles; it will diſſolve more eaſily, and the cryſtals will be larger and whiter than otherwiſe they would be.

The fixed Salt of Tartar.

TAKE what quantity of crude tartar you pleaſe; calcine it in a pot or glaſs-houſe: or you may put three or four pounds of it in ſtrong brown paper, which tie up with thread, and wet it with water; then put it upon ſome burning charcoals, and bury it with more coals: there let it continue, till all that is combuſtible be conſumed, and you will find the calcined tartar in an entire lump. Diſſolve it in warm water; then filtre and evaporate the ſolution to dryneſs, in a clean iron or earthen pan, and that which remains is the fixed ſalt of tartar[h]; which may be farther purified by diſſolution, filtration, and evaporation, till in the diſſolution it leaves no feces.

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[h] Mr. *Lemery* obtained four ounces of very white and well pu-

It is a good aperitive ſalt, and uſed to draw tinctures from vegetables; and is given in all obſtructions. Its doſe is from fifteen grains to one dram. Some think it is of the ſame uſe with every vegetable ſalt.

Let this ſalt be laid in a cellar, or other cool moiſt place, and it will attract the air, ſo as to liquify it, which, after filtration, we call oil of tartar per deliquium. It is endued with all the virtues of the ſalt, and is ſometimes dropped in lilly, bean-cod, or orange-flower water, to clear the complexion.

The firſt evaporation of the diſſolved tartar may be made in a clean iron pan, in which the liquor ought to be kept ſtirring, when it begins to coagulate, till the ſalt is quite dry; and if you deſign a farther purification, and it is not ſo white as you expect it, put it into a crucible, which ſet in a little charcoal fire, (ſo that the ſalt do not melt) and in a quarter of an hours time it will be very white.

Soluble

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purified ſalt, from ſixteen ounces of red tartar: he likewiſe obſerves, that a little more may be drawn from the white ſort. Forty pound of good *Rheniſh* tartar, perfectly well calcined in an open fire, after it had been diſtilled in a cloſe veſſel, yielded me ten pounds four ounces of an excellent alkaline ſalt.

Soluble Tartar.

MIX four ounces of ſalt of tartar [i] with eight ounces of cream of tartar, and pulverize them together: put them into an earthen pan, whereinto you have poured three pounds of ſpring-water; boil them till they are diſſolved, and remember to ſtir them now and then. Filtre the diſſolution whilſt it is warm; evaporate to dryneſs, and keep the remainder in a glaſs well ſtopped.

Its operation is cathartic and diuretic. It is given in obſtructions, cachexies, and dropſies. The doſe is from one ſcruple to a dram, or a dram and a half, in broth, or any other proper vehicle.

If you deſire the ſalt to cryſtallize, evaporate the liquor only till a ſcum appears: then in a clean earthen pan, or wide-mouthed glaſs, ſet it in a cold place to ſhoot into cryſtals; which muſt be carefully dried, and kept cloſe ſtopped, becauſe they are apt to diſſolve.

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[i] Inſtead of ſalt of tartar, take any fixed alkaline ſalt made perfectly pure, (ſee page 273) diſſolve this in water; then add to it, while it boils, the cryſtals of tartar, by little and little at a time, to prevent the ebullition, which always happens between theſe two, from cauſing the liquor to run over the ſides of the veſſel. The proportion of the two ingredients cannot be exactly determined by weight. If the alkaline ſalt be extremely pure, the cryſtals of tartar, or rather fine white tartar, are in too ſmall a quantity. It is better to add ſomewhat more of the latter than is neceſſary to exactly ſaturate the former: and, if the ſolution be ſuffered to cool, before it is committed to the filtre, the ſuperfluous quantity of tartar will be left upon it.

Chalybeated Soluble Tartar.

TAKE half a pound of the tincture of tartar, made with ſteel, and put it into a glaſs-body; pour upon it two ounces of the aforeſaid ſoluble tartar; ſet the mixture in a gentle heat of ſand to evaporate: ſtir it about ſometimes with a clean wooden ſpatula; and when it is dry, you will have a black powder, which keep in a vial well ſtopped.

IT is a good aperitive, and is endowed with all the virtues of the tincture of tartar with mars, according to the deſcription in the chapter of mars. Its doſe from one ſcruple to one dram, or one dram and a half.

BE careful in the drying of it, that it be not burnt, becauſe burning deprives it of its cathartic quality.

Chalybeated Tartar.

POUR three pints of ſpring-water into an earthen-pan, and ſet it over the fire to boil; as ſoon as it boils, put in half a pound of cryſtals of tartar, and half an ounce of ſalt of ſteel (finely powdered apart) and afterwards ground together:

let them boil a quarter of an hour, ſtirring them with a wooden ſpatula, till they are diſſolved; then ſtrain the mixture, boiling hot, through a cotton bag, into a clean pan, and ſet it in a cold place to ſhoot into little greeniſh cryſtals.

IT is endued with the qualities of the foregoing preparations; and its doſe from one ſcruple to one dram.

IT may be made with the ſalt, or filings of mars; if you put one ounce and a half of filings in the place of half an ounce of ſalt, and bake the common cryſtals of tartar to a brownneſs, it will diſſolve with more eaſe, and the cryſtals will be fairer.

Emetic Tartar.

TAKE cream of tartar, half a pound; crocus metallorum, two ounces; let them be very finely powdered, and after they are well mixed, put them into a glazed pot, and add two pounds of ſpring water; let them boil ſeven or eight hours, ſtir them often, and as the water waſtes, ſupply it; take off the mixture from the fire, boiling, and run it preſently through a flannel-bag: then evaporate two thirds in a glaſs-body, in ſand, and ſet the remainder in a cold place to ſhoot. Separate the ſuperfluous water, and evaporate as before; gather the cryſtals, dry them gently, and keep them in a vial for uſe [k].

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[k] This medicine will be uncertain in point of ſtrength, in proportion

It is a gentle emetic. Its doſe from three to ten or twelve grains.

It may be made with crocus metallorum, glaſs of antimony, flowers of antimony, or mercurius vitæ: the cream of tartar, as before, being baked, will render the emetic cryſtals more large and fair.

The ſoluble emetic Tartar.

PULVERIZE four ounces of cryſtals of tartar with one ounce of crocus metallorum; grind them well together, and put them into a glaſs body; pour upon them half a pound of ſpirit of urine; and when the ebullition is well over, add twelve ounces of ſpring-water: boil them in a ſand-heat ſeven or eight hours, ſupplying the liquor as it conſumes. Take the liquor from the fire as hot as you can, and run it through a fine flannel bag: then evaporate it gently, till it is dry, and keep it in a vial for uſe.

It is a very good emetic: The doſe is from four to fifteen grains, in broth, or thin water-gruel.

The

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portion as more or leſs nitre is uſed in the preparation of the crocus. This inconvenience may be remedied, by previouſly edulcorating the crocus with boiling hot water. Some chemiſts are accuſtomed to make it with glaſs of antimony, which is full as effectual as the waſhed crocus metallorum, and leſs apt to diſcolour the cream of tartar.

The ſpirit of urine partly ſatiates the acidity of the tartar, by which it more readily diſſolves. Take care to dry it without burning.

The emetic and cathartic ſalt of Tartar.

TAKE of ſalt of tartar, half a pound; crocus metallorum, two ounces; make them both into fine powder, and mix them well; put them into a crucible, and let them melt together half an hour; then take the matter from the fire, and diſſolve it in clean water: filtre the diſſolution, and evaporate, till a ſkin appears: then drop gradually into it, oil of vitriol, till the ebullition ceaſes, and over a gentle heat of ſand, evaporate to dryneſs: ſtir it, in the evaporation, with a glaſs ſpatula, or clean tobacco-pipe; and when the ſalt is cold, put it up into a wide-mouthed vial, well ſtopped, for uſe.

Its operation is emetic and cathartic. It is a febrifuge, given with good ſucceſs in tertian and quartan agues; alſo in dropſies, ſcurvy, jaundice, and hypochondriac melancholy. The doſe is from three to fifteen grains.

The evaporation will be beſt performed in a glaſs cucurbit; becauſe the inſpiſſation of the oil of vitriol would prey upon the glazing of an earthen veſſel, to the prejudice of the medicine.

Vitriolated Tartar.

PUT what quantity of oil of tartar you pleaſe into a glaſs cucurbit; drop gradually upon it rectified oil of vitriol, till the ebullition ceaſes: then evaporate the humidity in a gentle heat of ſand, and there will remain a very white vitriolated tartar, which keep in a wide-mouthed glaſs well ſtopped.

It is a little cathartic and diuretic, and a good aperitive: it is given in quartans, in ſcrophulous and hypochondriacal caſes.

IT may be made of pure ſalt of tartar inſtead of the oil, dropping the oil of vitriol upon the ſalt, and ſtirring it with a glaſs ſpatula, or clean tobacco-pipe, till the fermentation is over: but take care you do not evaporate too much, leſt you deprive it of the acidity it ought to retain.

The Soap of Tartar.

TAKE Rheniſh-wine tartar, or cream of tartar, and ſalt-petre, of each one pound, in powder; mix them well together, and put them into a red hot crucible by a ſpoonful at a time: when the mixture is melted, take it out with a little iron ladle, and put it into a warm earthen pan, adding to it as much warm water as is neceſſary to diſſolve it: filtre and dry it into a ſalt, which grind into an impalpable powder, or as fine as poſſibly you can; then put it into a wide-mouthed glaſs, and expoſe it to the air, till it is a little moiſtened, which it will ſufficiently be in ſixteen, eighteen, or twenty-four hours, according to the moiſtneſs or dryneſs of the weather: then put to each pound of the ſalt, four ounces of rectified oil of turpentine; ſtir them well together with a wooden ſpatula, till they ſeem to be incorporated: then ſet the mixture aſide, and cover it to keep out the duſt. Stir it well two or three times a day, till you perceive the oil and ſalt incorporated, and of the conſiſtence of a ſyrup: if it wants oil to make it of that conſiſtence, add more.

This ſoap is an excellent diuretic, and ſomething cathartic, and is given in the ſtone and gravel in the bladder or kidneys. Its doſe from one ſcruple to a dram, in a little fine ſugar. It is called the corrector of vegetables, and the chief ingredient which corrects the opium in *Starkey*'s or *Matthews*'s pill.

The ſalt may be evaporated in a clean iron pan; and if it be a little moiſtened by the air, before the oil is put to it, their union will be facilitated thereby. You may alſo diſtill the oil of turpentine from aromatic herbs and ſpices, to give it an agreeable ſcent. The older the ſoap is, the better it is: I have ſeveral ounces of it by me now, which I made in the year 1665; and I value it as much as its weight in gold.

" *Another Method of making Soap of Tartar, according to Mr.* Geoffroy.

TAKE of the pureſt and ſtrongeſt fixed alkaline ſalt, ten ounces: heat it gently in a crucible, till it is almoſt red hot: then put it into an iron mortar made exceedingly hot; and grind it, as expeditiouſly as you can, into a fine powder, with a hot iron peſtle. To this ſalt, while hot, add gradually eight ounces and a half of ethereal oil of turpentine: the oil will immediately, with a hiſſing noiſe, diffuſe itſelf intimately through the ſalt, and form with it a truly ſaponaceous maſs.

If this ſoap is not immediately uſed, a larger quantity of oil may be added, to give it a ſoftiſh conſiſtence; for, with time, it dries and hardens conſiderably."

" *Method of preparing Soap without Fire, according to Mr.* Geoffroy.

TAKE five pound of well calcined lime, and ten pound of Alicant kelp. Powder the ſalt, and break the lime into pieces as big as an egg: put the lime into an earthen pot, and cover it with the ſalt: moiſten the mixture with warm water, which gradually ſprinkle on it, till the lime is reduced to a kind of meal: then ſtir the whole well with a wooden ſpatula, and pour on eighteen or nineteen pints of water: leave the mixture to ſettle for twelve hours; then filtre the lye. Pour upon the remainder ten pints of water; boil it in an iron pan for an hour; then filtre the liquor, and return it to the iron pan, which ſet over a good fire: as the liquor evaporates, add, by degrees, all the firſt lye. Continue the evaporation, till a pellicle forms itſelf on the ſurface of the liquor [l], and a drop of it, let fall on a piece of glaſs, inſtantly appears covered with a ſkin. Then remove it from the fire, and put it in glaſs veſſels, to be kept cloſe ſtopped till uſed.

POUR one part of this lixivium upon two parts of any expreſſed oil, in a ſtone pan: ſtir them, with a wooden ſpatula, till they come to the conſiſtence of thick cream: let this ſtand for four or five days, ſtirring it every now and then; and it will become a perfect ſoap [m]."

" *Method*

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[l] At this time, the liquor will corrode the pan, and grow black; but if the lye be kept in glaſs veſſels for three or four days, it will depoſite a black ſediment, and grow clear and fit for uſe.

[m] The facility and ſmallneſs of expence of preparing ſoap after this manner, ſeem well to deſerve the attention of the ſoap-boiler. The method is certainly practicable to advantage, and requires no more than a ſuitable apparatus, to agitate and ſtir the ingredients well together; and there ſeems to be no other ſecret in the affair, than to be ſure to have your lye of a due degree of ſtrength.

" *Method of making hard Oil-Soap with Fire.*

TAKE *Ruſſian* pot-aſhes, and well-burnt freſh lime, of each one pound: reduce the pot-aſhes to fine powder, and ſprinkle the lime with a little water, which will make it fall into powder. Then mix them well together in an earthen pan: pour on the mixture a gallon of boiling hot water; and ſtir the whole well together. When the lye is perfectly ſettled and fine, which will be in four or five hours, decant it for uſe. Upon the feces pour the ſame quantity of water, and proceed as before. In order to know the ſtrength of your lye, pour a pint of common water, into a bottle, of ſuch a ſize, that the liquor may riſe ſome height into its neck, and mark the place with a diamond: fill the bottle with the firſt lye up to the mark; and for every quarter of an ounce that it weighs above ſixteen ounces troy-weight, add a quarter of a pint of the ſecond lye to every pint of the firſt: this will nearly reduce the lye to a proper ſtrength for making of ſoap. If upon weighing a ſecond time, it ſhould prove too heavy, add more of the weak lye: but if it ſhould be a ſmall matter lighter than the ſtandard weight, it is of no conſequence. All the inſtruments employed in this proceſs ſhould be either of wood, earthen-ware, or glaſs. If iron or pewter be employed, the lye will corrode them, and grow black: but upon ſtanding, depoſite a ſediment, grow clear again, and be fit for uſe.

TAKE nine pound of the above lye, and three pound of any freſh-drawn expreſſed oil. Let them ſimmer together for ſome hours, and they will unite. Boil the liquor a little, and it will grow tranſparent and ſlimy, and, when cold, appear like jelly: throw in, by little at a time, ſome common ſalt, till it loſes its ſlimineſs. Continue the boiling, till a drop of it on a tile coagulates, and the water runs from it: put out the fire, and the ſoap will gradually ariſe on the top of the liquor: before it is quite cold, pour it into a wooden mould with a cloth bottom: at length, take it out, and lay it aſide till it is grown of ſufficient hardneſs."

"*Method of Purifying Soap for Medicinal Uſe.*

SLICE one pound of pure, dry, hard, *Genoa*, *Alicant*, or any other oil-ſoap, into a clean pewter veſſel: pour upon it two gallons of rectified ſpirit of wine: place the veſſel in *balneo mariæ*, and apply ſuch a degree of heat, as may make the ſpirit boil, when it will ſoon diſſolve the ſoap. Let the veſſel ſtand cloſe covered in a warm place, till the liquor has grown perfectly clear; if any oily matter ſwim upon the ſurface, carefully ſcum it off. Then decant the ſolution from the feces; return the limpid liquor into the pewter veſſel, or ſtill;

lute on its head, and diſtill off all the ſpirit that will riſe in the heat of a water-bath. Expoſe the remainder to a dry air for a few days, and it will become a white, opaque, and ſomewhat friable maſs, having little or no ſmell, and proving, upon examination, not in any degree acrimonious, but quite mild and ſoft, and conſequently well fitted for medicinal purpoſes. If there has been too much common or alkaline ſalt in the ſoap, it will be ſeparated in the feces."

The diſtilled Oil and Spirit of Tartar.

FILL an earthen or coated glaſs retort, half full with cream of tartar; place it in a reverberatory furnace, and lute to it a receiver [n]: let the

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[n] In the diſtillation of tartar, a large portion of elaſtic vapour is generated, which, unleſs a great deal of care be taken, certainly burſts the diſtilling veſſels, if cloſe luted. To prevent this accident, a long pipe may be perpendicularly inſerted at the junctures of the veſſels, through the luting, ſo as to allow a free exit for the incoercible vapour, while the diſtilled liquors, not riſing ſo high, are condenſed in the pipe, and conveyed into the recipient. See *Hales*'s Veget. Stat. vol. ii. p. 281.

This contrivance does not anſwer ſo well as may at firſt be expected: for the luting becomes ſoft and uſeleſs, from the liquid matters which fall from the pipe, penetrating it. This inconvenience likewiſe happens if the common veſſels are made uſe of; and *Boerhaave* mentions this accident as unavoidable. But, if inſtead of a common recipient a tubulated one be made uſe of, or an adopter, into the extreme orifice of which a tube ſomewhat bent the fire of the firſt degree be for three or four hours, then increaſe it to the ſecond three hours longer, and on to the third three or four hours more; at laſt to the fourth degree, where keep it, till no fumes aſcend into the receiver, in which you will find a fetid oil and ſpirit: you may ſeparate the oil by filtring it through a coffin of paper. Then put the ſpirit into a long-bolled retort, and in a gentle heat of ſand rectify it, and ſeparate the phlegm which comes over after the ſubtile ſpirit [o].

To make this ſpirit more aperitive and excellent, to three parts of the oil and ſpirit, which your diſtillation produced, put one part of ſpiritus nitri dulcis; ſhake them well in the receiver, and put them carefully into a clean glaſs retort, which ſet in a ſand-furnace; fit and lute on a receiver, and

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bent at one end is to be inſerted, and the juncture ſecured with a bladder; the diſtillation may be performed with eaſe and ſafety.

There is no neceſſity of coating the glaſs retort, provided it be placed in a ſand furnace, the heat of which is ſufficient, and likewiſe more eaſily regulated than the fire of a reverberatory. Crude tartar, either white or red, provided it be clean, is full as good as cream of tartar.

[o] Mr. *Lemery* ſays, that forty-eight ounces of tartar will yield four ounces of phlegm, eight ounces of ſpirit, and three ounces of oil; and that from the black maſs which remains in the bottom of the diſtilling veſſel, and weighs two and thirty ounces, you may extract twelve ounces of fixed ſalt. It is pretty remarkable, that this is the only inſtance ſpoke of by chemical writers of procuring a fixed alkaline ſalt from vegetable matters without expoſing them to the open air.

and give it a fire of the firſt degree, till the lute be dry : then advance to the ſecond ; in which you will have a moſt penetrating and grateful ſpirit, which is one of the moſt powerful diaphoretics that I know. It is alſo diuretic and anodyne. It is given in the palſy, epilepſy, aſthma, hyſterical maladies, ſcurvy, and in fevers, with good ſucceſs. Its doſe is from two ſcruples to two drams, in any proper vehicle.

THE phlegm may be ſeparated either at the firſt diſtillation, or in its rectification : if at the firſt diſtillation, put on the receiver, without luting it ; and when the white fumes appear, change, and lute on the receiver.

A Volatile Salt of Tartar.

TAKE the lees of wine[p], and dry them gently ; when dry, beat them into groſs powder : fill a glaſs coated, or earthen retort, half full with them ; place it in a reverberating furnace, give it a gentle fire to drive off the phlegm which firſt comes over ; and when you perceive fumes to riſe, fit and lute on the receiver, augmenting the fire gradually ; till at laſt, with the moſt extreme de-

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[p] Lees of wine differ greatly from tartar : they ſubſide from the vinous liquor to the bottom of the containing veſſel, before the tartar begins to ſhoot to its ſides. Upon diſtillation with water in the ſame manner, and with the ſame inſtruments that eſſential oils are drawn, they yield a large portion of inflammable ſpirit, and a conſiderable quantity of eſſential oil.

degree, no more fumes will ariſe. Then let all cool, and take off the receiver, in which you will find a whitiſh liquor, which contains the volatile ſalt, and upon it will ſwim a little fetid oil: put it into a phial, and with a little clean water rince out the ſalt which adheres to the ſides of the recipient, and put it to the reſt: then put them into a coffin of brown paper, and the ſpirit with the ſalt will paſs through, and leave the oil in the coffin.

PUT the ſpirit into a long matraſs; fit to it a head and receiver; lute the joints well, and with a gentle heat of ſand ſublime the ſalt into the head: when it is pretty well charged, take off that head, and preſently fit on another; and continue the ſame degree of fire, 'till the ſalt begins to melt: then change the head, and augment the heat a little, to diſtill the volatile ſpirit of tartar. When the drops are inſipid, take off the receiver, and keep the ſpirit from the air in a vial well ſtopped, becauſe of its volatility, as alſo the ſalt; for if the leaſt air be admitted, the ſalt will relent.

Its operation is diaphoretic and diuretic. Its doſe from ten grains to half a dram. It is a medicine much eſteemed by many phyſicians; and is given in the palſy, apoplexy, epilepſy, tertian and quartan agues: It opens all obſtructions, and provokes the terms. The volatile ſpirit is ſome of the phlegm impregnated with the ſalt, and endued with the ſame virtues, and given from ten drops to two ſcruples.

If you can have ſuch lees as the juice is preſſed out of by thoſe who make vinegar, it will ſave you the labour of drying them, and will be altogether as good for this operation : and if in the rectification, you deſire to preſerve the ſalt in a dry form, you muſt be watchful ; and when you ſee the ſalt have the leaſt inclination to diſſolution, you muſt change the head, preſently take out the ſalt, and put it into a dry phial, well ſtopping it, to preſerve it from the air, which would preſently diſſolve it : but if ſo much water come over with it, as to render it in a liquid form, it then has the ſame effect with the ſalt, being given in a greater doſe.

If after the rectification, you ſeparate the phlegm from the oil, and return the volatile ſpirit upon it, and put to them a third of their weight of ſweet ſpirit of nitre : digeſt them in a double veſſel two or three days, in a gentle heat : then unlute the veſſel, and fit and lute on a head, with its receiver ; you will obtain, with a gentle heat, a moſt excellent and penetrating ſalt and ſpirit.

Another volatile Salt of Tartar.

TAKE the ſatiated ſalt of tartar, (deſcribed to make the true tartarized ſpirit of wine ;) fill a coated retort half full with it ; place it in an open furnace, lute on a receiver, and give a gradual fire; obſerving the ſame method as in the former operation, both in the diſtilling and rectification.

Tincture of Tartar.

PUT a pound of ſalt of tartar into a crucible, which place in a melting furnace, and let it heat gradually, till it is of a white melting heat; cover it well with coals, and keep it in the moſt extreme degree of fire, five or ſix hours: then pour the matter into a warm mortar, and whilſt warm, powder it, and put it into a matraſs, heated upon warm ſand, to preſerve it from breaking with the hot ſalt: then pour upon it twenty ounces of tartarized ſpirit of wine; invert and lute well to it another matraſs, to make a double veſſel. Make a gentle fire, and let the whole ſimmer ſix or ſeven hours, and in that time the ſpirit will acquire a good tincture: which when cold, put into a phial, and keep it well ſtopped [q].

ITS operation is diaphoretic and diuretic. It is an excellent aperitive, and a good anti-ſcorbutic. Its doſe from ten to fifty or ſixty drops, in any convenient vehicle. Melt not leſs than one pound of the ſalt, becauſe it waſtes conſiderably by long fuſion; and be ſure that your ſpirit of wine be totally dephlegmated, otherwiſe your tincture will not be full.

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[q] This tedious proceſs is deſcribed, under the name of *Helmont*'s tincture of ſalt of tartar, by *Boerhaave* in his *Elem. Chem. Proc.* 80. in the moſt minute and circumſtantial manner. But however exactly the operation be performed, the ſpirit will receive no colour from the ſalt, unleſs the ſalt retains ſome of the oil

The ſecret Corrector.

I Have before taught you how to make a very good ſoap of tartar; but this, which follows, I have kept many years for private experiments: and indeed it has afforded me abundance of ſatisfaction.

TAKE cream of tartar, and purified nitre, ana three pounds; powder and mix them, and put them by ſpoonfuls into a red hot crucible: when the matter is melted, diſſolve it in warm water, filtre the diſſolution, and evaporate to a dry ſalt, and put it into a clean glaſs body, and add three times its weight of pure diſtilled vinegar, (by half a pint at a time;) ſhake the glaſs, and place it in a ſand furnace; then draw off the liquor, which will be an inſipid phlegm: diſſolve the ſalt again in

oil of the vegetable, from which it was prepared, or has got a tinge from ſome of the fuel falling into the crucible, or from the ſmoke of the coals, as *Geoffroy* and others have obſerved. This preparation therefore may be made without the long and tedious fuſion ordered above, by taking a quantity of crude tartar, and calcining it, as directed in the making of ſalt of tartar, to a greyiſh and almoſt white aſh; at which time, it is become ſufficiently ſaline to impart to a ſpirit a notable degree of acrimony, and retains oil enough to give it the deſired colour.

in ſpring-water; filtre and evaporate as before; powder the ſalt, and put it into a clean body, adding three times its weight of pure diſtilled vinegar, and draw it off as before. Repeat theſe operations, till the ſalt has no feces, and the diſtilled vinegar comes off as acid as when put on. This is the foliated ſalt of tartar, which readily diſſolves in ſpirit of wine [r].

To this foliated ſalt, put as much ſpirit of wine as will diſſolve it; let it ſettle, and decant the ſpirit; draw off the remaining ſpirit by a gentle heat. Take one pound of this ſalt, and of offa alba (made with ſpirit of wine and ſpirit of urine) half a pound; grind them well together, and add a pound and a half of ſpirit of wine, impregnated with an eſſential oil, (according to your intended uſe;) as oil of turpentine, juniper, ſaſſafras, mint, marjoram, ſavin, cloves, cinnamon, *&c.* Put them into a body, with its head and receiver; lute the joints, and draw off the ſpirit of wine, with ſo very gentle a heat in aſhes, as will only elevate the ſpirit, and leave the oil with the ſalt: impregnate the ſpirit with more oil, and return it upon the ſalt. Repeat the operation, till your ſalt is become a ſoap. This is the grand ſecret corrector of vegetables, animals, and minerals: for the uſe of it, I refer you to the ingenious Dr. *George Starkey*'s *Corollary Appendix to his Pyrotechny aſſerted and illuſtrated.*

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[r] This ſalt may be more conveniently made by taking a ſufficient quantity of vinegar at firſt, and then gradually adding the ſalt to it: one pound of the latter requires about twenty of the former. It is likewiſe leſs troubleſome, and much more expeditious, to evaporate the phlegm of the vinegar in a ſhallow, broad, ſtone or glaſs veſſel, than to draw it off in retorts. If the ſalt be required white and foliated, it ſhould be kept juſt melted over the fire for ſometime, afterwards diſſolved in water, filtred and evaporated to dryneſs, and at laſt diſſolved in highly rectified ſpirit of wine, and again filtered and inſpiſſated; when being melted, and kept in a warm place for ſome time, it will ſhoot into white leaves ſomewhat reſembling talk. *Sennertus* and ſome others, purify this ſalt to a very great degree of whiteneſs: but *Boerhaave* is of opinion, that this labour is not only uſeleſs, but likewiſe detrimental. See ſome further remarks on this proceſs in p. 55, and 303, of *Pharmacop. Reform.*

If you can have patience, and proceed carefully, you may volatize every grain of this ſalt: I have often done it, and with pleaſure ſeen the good effects of it, in a medicine only prepared by myſelf.

CHAP. XVII.

Of ALOES.

IT is the juice of a plant called ſemper vive, which grows in *Egypt*, the iſland of *Socotora* in the *Perſian-Gulph*, in the iſland of *Barbadoes* in the *Weſt-Indies*, and other places. That of *Socotora* is accounted the beſt, becauſe they tranſplant and cultivate it; but in other places they uſe the plant wild, as they find it. Every country produces two ſorts of it, *viz.* that made of the juice which drops from the plant by inciſion, and that made of the expreſſed juice. Hepatic aloes is that ſort made by inciſion in all countries, and takes its name from its ſimilitude to the liver [s].

THE hiſtory of this plant is very well worth reading; its ſudden and vaſt increaſe (even to twenty feet high, with a ſtem as thick as a man's thigh) and that in a very few days, is very ſurprizing! but ſuch a one Dr. *Brown* ſaw in the gardens of *Conte Auguſtino Giuſto*, at *Verona*. *Vid.* his Travels. *p.* 202. And the like alſo was, not many years ſince, in a garden at *Lambeth*. *Vid. etiam Petri Borellii Obſervat. Cent.* i. *Obſerv.* 1.

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[s] There are two ſorts of aloes, the Socotorine, or finer aloes, and the caballine, or coarſer. The Socotorine is bright, ſhining, friable in the winter, pliable in the ſummer, of a yellowiſh red colour, with a purple caſt: reduced to powder, it is of a bright golden colour, of an aromatic, bitter taſte, and ſtrong, but not ungrateful, ſmell. The inferior ſort of aloes may be further divided into hepatic and caballine, which are both obtained from the ſame plant, and differ only in purity: the firſt is made of the finer juice decanted from the feces; the latter from the remainder. Both theſe ſorts are eaſily diſtinguiſhed, by their ſtrong, diſagreeable ſmell, from the Socotorine; though ſometimes they are ſo artfully managed, as not to be diſtinguiſhed by the eye. Mr. *Boulduc* obſerves, that the hepatic aloes contains more reſin than the Socotorine; that this reſin has little, if any purgative virtue, andthat the hepatic purges more, though with leſs irritation than the other.

Extract of Aloes.

DISSOLVE what quantity of Socotorine, or hepatic aloes, you pleaſe, in the diſtilled water of roſes, ſuccory, borage, or any other; filtre the diſſolution through a flannel bag, and evaporate to the conſiſtence of an extract. A better extract is made with ſpirit of wine; but the beſt is made with tincture of tartar, which not only corrects the crudity of the aloes, but the pure ſalt of tartar, which the ſpirit of wine is impregnated with, will preſerve it in its full virtue, and due conſiſtence, very many years.

IF the aloes be very good, it will almoſt all diſſolve, leaving nothing behind it, but ſome dirt, which accidentally falls into the juice in drying.

CHAP. XVIII.

Of MYRRH.

IT is a reſinous gummy juice, which drops from a little thorny tree by inciſion. The beſt is in tranſparent ſmooth drops; and when new, of a whitiſh colour, but in time becomes yellow, but continues tranſparent, and breaks with little white ſpecks in it: ſuch as this is not often met with; but of ſuch as is commonly vendible, chuſe that which is yellow, or red, bitter, tranſparent, and of a grateful ſmell [t].

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[t] From freſh myrrh an eſſential oil may be obtained, by diſtilling it with water in the common manner, exactly reſembling the myrrh in taſte and ſmell. *Hoffman* (*Obſervat. Phyſico-chem. lib.* i. *obſ.* 5.) greatly recommends the uſe of this oil in the aſthma, and as a preſervative in epidemic diſorders.

IT grows in *Abyſſine* in *Africa*, and *Moco* in *Aſia*: that of *Abyſſine* comes through *Egypt* into *Europe*; and that from *Moco*, by the caravans to *Aleppo*, &c.

Tincture of Myrrh.

PUT into a matraſs of fine myrrh, in powder, one pound; of ſpirit of wine, four pounds: invert another glaſs into the mouth of the matraſs, to make a double veſſel; lute the juncture, and ſet the veſſel in a gentle heat of ſand, till the tincture is extracted. Shake the materials well together two or three times every day, and let the ſpirit be charged with a full red before you pour it off from the myrrh, which will require two or three days time [u].

THIS tincture is ſudorific and aperitive: it is given in the apoplexy, lethargy, and palſy; is good to expedite womens labour, and is often applyed outwardly. Its doſe is from eight to twenty-four drops, in a proper vehicle.

Oil

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[u] Myrrh diſſolves freely in boiling water, but about one third, or ſomewhat leſs, ſubſides as the liquor cools: this part, if the myrrh be very pure, is almoſt wholly taken up by ſpirit of wine. —I have oftimes made an excellent and fragrant tincture of myrrh, by groſly pulverizing ſome of the freſher and purer ſorts, and then expoſing it to the action of a dry air, in a ſhady place, for a few days; when it was again pulverized, and expoſed as before, for a longer time, and then a pure rectified ſpirit poured on it, which ſoon extracted, without the aſſiſtance of any heat, a deep-coloured tincture, containing in a very eminent degree, the fragrant ſmell, and bitter aromatic taſte, of the myrrh.

Oil of Myrrh by Diſtillation.

FILL a retort half full with coarſe myrrh, place it in a ſand-furnace, and lute to it a receiver; give it fire by degrees, to the greateſt height: when the fumes ceaſe, let out the fire, and in the receiver you will have a fetid oil and an acid ſpirit [w].

THE oil is externally applied to bring ſtubborn ulcers to ſuppuration. The ſpirit is diaphoretic and diuretic. Its doſe is from eight to twenty-four drops, in a proper vehicle. You may rectify the oil and ſpirit together, and then ſeparate them: then put to the ſpirit a fourth part of its weight of ſpiritus nitri dulcis, and rectify them; by which the ſpirit will be rendered more agreeable both in ſmell and taſte, and likewiſe more aperitive.

Oil of Myrrh per deliquium.

BOIL eggs, till they are hard; ſplit them in the middle, and take out the yolks; fill the cavities with fine myrrh, in powder; place them upon little ſticks of about an inch and a quarter long, three or four of them being pricked into the egg; ſet them in a clean earthen pan, in a cellar, or ſome ſuch moiſt place, and there will drop from them into the pan, a liquor, which is called oil of myrrh. Its uſe is to take away ſpots and blemiſhes on the ſkin, outwardly applied.

CHAP.

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[w] Two pounds of myrrh diſtilled in a retort, according to the directions above, yielded about four ounces of oil.

CHAP. XIX.

Of SAFFRON.

IT is a flower which comes to its perfection in the latter end of *September*, and in *October*. That of *England* is accounted the beſt, both for the largeneſs of the leaf, its fragrancy, and colour. The *Engliſh* have alſo a way to preſerve it, exceeding that of any other country.

Tincture and Extract of Saffron.

PUT four ounces of good *Engliſh* ſaffron into a matraſs, with twenty-four ounces of ſpirit of wine; let them ſtand in a gentle heat of ſand forty-eight hours, ſometimes ſhaking them, and you will find the ſpirit well charged with the tincture of the ſaffron: pour off the tinged ſpirit, and put on one pound more, proceeding as you did before, and you will have a ſecond tincture, but not altogether ſo deep as the firſt: put both the tinctures into a cucurbit, place it in ſand, lute on its head and receiver, and in a gentle heat draw one half of the ſpirit of wine off, and that which remains behind will be a ſtrong tincture. After decantation of the tinged ſpirit, you may add new ſpirit of wine as long as it extracts any tincture; and then put all the tinged ſpirits into a cucurbit, and draw off, till you leave not above twenty ounces of tincture in the cucurbit.

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THIS tincture is made into an extract, by evaporating it to a due conſiſtence [x]. In a very gentle heat of aſhes, diſtill off as much of the ſpirit of wine as you can, without burning the extract; then pour it into the bottom of a glaſs, cut ſhallow, or a clean ſmooth earthen veſſel: ſet it upon ſo much hay or ſtraw, as to ſtand firm in a balneum; and in that heat keep it continually ſtirring, till it is evaporated into an extract.

CHAP. XX.

Of ELIXIRS.

ELIXIR is the name of a medicine, intended (by adepts) to heal all human diſeaſes, and remove the impurities of imperfect metals: but my deſign is only to handle thoſe vegetables, whoſe eſſential parts being ſeparated from the groſſer and more feculent, by proper menſtruums, and the induſtry of the artiſt, will yield greater medicines by the union of their virtues; and ſo may not improperly, though ſubordinately, be called by the name of elixirs. And firſt of

Elixir Proprietatis, with Oil of Sulphur.

TAKE of the beſt aloes, fine myrrh, and *Engliſh* ſaffron, of each one ounce; let the

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[x] The ſpirit of wine ſhould be highly rectified, and the diſtillation is more conveniently performed in a water-bath; the heat of which is ſufficient to reduce the tincture to the proper conſiſtence of an extract.

myrrh and aloes be beaten into fine powder, and the ſaffron cut into ſmall pieces; put them into a long body, or bolt-head, and put to them nine ounces of tartarized ſpirit of wine; make the veſſel double, fit for circulation, and ſet it in a gentle heat for ſeven days, ſhaking it once or twice a day; then unlute the veſſel, and put to the tincture three ounces of oil of ſulphur by the bell, by an ounce at a time; and when all is in, ſhake them well, lute on the other part of the circulatory, and let them ſtand in warmth fourteen days, agitating them as before, once or twice a day; then let them cool, and preſs out all the moiſture through a ſtrong cloth: let it ſtand till ſettled, and by decantation ſeparate the elixir from the feces; put it into a phial, and keep it cloſe ſtopped for uſe.

ITS operation is diaphoretic and aperitive: it fortifies the heart, and purifies the blood, creates an appetite, and helps digeſtion; and ſome account it a great preſervative againſt peſtilentious air, with many other virtues. Its doſe is from ten to fifty or ſixty drops, in wine or water, beer or ale, broth, or ſpring-water, or any other vehicle appropriated to the diſeaſe you would remove by it.

Elixir Proprietatis, with Tincture of Tartar.

TAKE of ſelect myrrh, aloes, and ſaffron, ana one ounce; beat and cut as before; put them into a veſſel of circulation, and pour upon them twelve ounces of tincture of tartar: place them in a gentle heat, to ſtand twenty-one days, ſhaking the mixture every day; then let it cool, and preſs it out as you did the former; let it ſettle: decant the elixir from the feces, and put it into a phial, which ſtop for uſe.

Its operation is diaphoretic and diuretic; it is ſaid to have all the good qualities of the former, and to be more aperitive, and a greater ſweetner of the blood. Its doſe is from one ſcruple to one dram and a half.

Elixir Proprietatis, with Spirit of Harts-Horn.

TAKE of the beſt myrrh, aloes, and ſaffron, ana one ounce; tartarized ſpirit of wine, eight ounces; ſpirit of harts-horn, four ounces; and proceed in every thing as in the preceding proceſs.

This preparation is alſo diaphoretic and diuretic, and endued with the virtues of the former, but more effectual in hyſteric vapours.

Elixir Proprietatis, with Sal Volatile Oleoſum.

TAKE of choice myrrh, aloes, and ſaffron, ana one ounce; place them in a circulatory veſſel, and put to them of tartarized ſpirit of wine, four ounces; and of ſal volatile oleoſum, nine ounces, and proceed in every thing as before.

THIS is diaphoretic and diuretic, is proper in all caſes where the former is uſeful, and more agreeable both to ſcent and taſte. Its doſe the ſame with the other.

Anti-Convulſive Elixir.

TAKE of ſpirit of ſalt armoniac, (made with ſalt of tartar) four ounces; of tartarized ſpirit of wine, eight ounces; unrectified oil of amber, two ounces; and two drams of oil of caraway-ſeeds: put them into a retort, and diſtill in a gentle ſand-heat. Return the oil and ſpirit upon the reſidence, and re-diſtill, repeating the cohobations, till the ſpirit, oil, and ſalt are perfectly united: then put into a matraſs, half an ounce of caſſumunar, one ounce of Ruſſia caſtor, two ounces of the ſeed of male pæony, and one dram of aſſa fœtida; pour the ſpirit upon theſe ingredients, ſet the matraſs in a digeſting heat four or five days, and then decant the elixir. The doſe is from three to threeſcore drops in black-cherry-water, *&c.*

An opening Martial Elixir.

TAKE of ſalt armoniac, and ſalt of tartar, ana one pound; diſſolve them (ſeparately) in a ſufficient quantity of water: mix the diſſolutions, and pour them upon one pound of filings of iron, in a matraſs, which ſtop cloſe, and let it ſtand in a gentle heat two or three days, ſhaking it often every day; then let the reſidue ſettle, and decant it carefully. Into three pounds of this liquor; put of myrrh, aloes ſaffron, and the dried leaves of ſavin, ana two ounces: let them digeſt three days, ſhaking the matraſs as before; decant the liquor, and to the reſidence put one pound of rectified ſpirit of wine, and let them digeſt forty-eight hours: then decant the liquid, and with your hand preſs the reſidence through a ſtraining cloth. Mix this ſpirit and the former liquor; ſhake them, let them ſettle, and decant the clear for uſe.

THIS powerfully opens all womens obſtructions, and is of great uſe in hyſteric and hypochondriacal caſes. The doſe from twenty to fourſcore drops.

The Anti-Peſtilential Elixir Proprietatis.

TAKE of myrrh, aloes, ſaffron, and camphor, ana one ounce; Virginia ſnake-root, and cochineal, ana half an ounce; powder what is to be powdered, mix the ingredients, and put them into a matraſs; pour upon them ſpiritus nitri dulcis, twelve ounces, and let them ſtand in digeſtion twenty-one days, obſerving every thing as in the foregoing proceſs.

THIS is ſaid to be the moſt powerful medicine againſt the plague, and all contagious diſeaſes, that is yet known: It expells wind, and is an excellent remedy againſt the colic, and all gripings of the ſtomach and bowels; a great aperitive, and gives eaſe in the ſtone, both in the reins and bladder. Its operation is diaphoretic and diuretic. Its doſe is from half a ſcruple to one dram, or one dram and a half, in any proper vehicle.

The Volatile Elixir Proprietatis.

IT is the foregoing elixir, with ſpirit of wine, nine ounces; and oil of ſulphur, three ounces; with the ſame proportions of myrrh, aloes, and ſaffron: after digeſtion it muſt be diſtilled in a gentle heat, with two cohobations of the ſame ſpirit, which muſt be drawn off with three days digeſtion between each cohobation.

IT has the ſame virtues with moſt of the preceding elixirs, and is more agreeable to the palates of many people. Its operation is diaphoretic and diuretic. Its doſe from ten drops to a hundred in any proper vehicle.

Elixir Vitrioli.

TAKE galangal, one ounce and a half; calamus aromaticus, mint, and ſage dried, ana half an ounce; cinnamon, cloves, and ginger, ana three drams; nutmegs and cubebs, ana two drams;

lignum-aloes and lemon-peel, ana one dram; white ſugar-candy, three ounces; all pulverized: put them into a matraſs, and pour upon them oil of vitriol, one pound; ſpirit of wine, one pound and a half. Invert another to make it a double veſſel; lute the joint, and ſet it in a gentle heat to digeſt, fifteen or twenty days. It is accounted a good ſtomachic. Its doſe from ten to ſixty or ſeventy drops.

" *Another Method of making Elixir of Vitriol.*

TAKE of cinnamon, two ounces; leſſer cardamom-ſeeds, ginger, long pepper, of each one ounce. Put them into a matraſs, and pour on them five pints of good, clean proof-ſpirit. Digeſt the mixture for two or three days in a gentle heat; then ſtrain off the tincture, and gradually add to it twenty ounces of oil of vitriol: let the whole ſettle for ſome time; decant the clear elixir from the feces, and filtre it for uſe [y]."

Elixir Pæoniæ.

TAKE of the roots of *Engliſh* palma Chriſti, pyrethrum, ana one ounce; miſletoe of the oak, fennel-ſeeds, anacardia, ana ſix drams; roſemary-flowers, Arabian ſtæchas, lavender, ana three ounces; ſhavings of harts-horn, elks-hoof, man's-ſkull, ana one dram and a half; marjoram, one handful; rectified ſpirit of wine, two pounds: digeſt theſe fourteen days, and then diſtill in balneo mariæ; to which add the roots, flowers, and ſeeds of pæony, ana one ounce; ſpec. diamoſc. dulcis, xyloaloes, of each half an ounce; digeſt them a month, and filtre. To twelve ounces of this tincture, add one dram and a half of ſalt of pæony, and four ounces of ſpirit of vitriol, rectified and impregnated with native cinnabar: then circulate them into an elixir.

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[y] See *Pharmacop. reform.* p. 232, 216, 161.

Otherways it is made as followeth.

TAKE the root of *Engliſh* palma Chriſti, pyrethrum, miſletoe of the oak, fennel-ſeeds, anarcadia, roſemary-flowers, marjoram, Arabian ſtæchas, caſtor, and lavender, in the foregoing quantities: and (inſtead of the ſhavings of harts-horn, elks-hoof, and man's-ſkull) take of the aromatic ſpirit of harts-horn, hereafter mentioned, (*vid.* chap. of harts-horn) half an ounce: digeſt them all in two pounds of rectified ſpirit of wine fourteen days; at the end of which, diſtill them in balneo mariæ, or a gentle heat of ſand or aſhes; and to every pound of this diſtilled ſpirit, add four ounces of rectified ſpirit of vitriol, the roots, flowers, and ſeeds of pæony, ana one ounce; ſpec. diamoſc. dulcis, xyloaloes, of each half an ounce; and with one dram of ſalt of pæony, circulate into an elixir.

Elixir Salutis.

TAKE of the leaves of ſena, half a pound; jalap, in powder, four ounces; elecampane alſo in powder, and liquorice, *ana* two ounces; juniper-berries, anniſeeds, and coriander-ſeeds, ana one ounce; cream of tartar, one ounce and a half; honey and manna, of each two ounces; ſlice the liquorice, put the ingredients into a glaſs body, and put to them *French* brandy, or clean *Engliſh* proof-ſpirits, four quarts; lute on a glaſs, to make a circulatory, and let them ſtand in a gentle heat of ſand two or three days; then pour off the liquor, and preſs it out from the ingredients, and let it ſtand in a veſſel cloſe ſtopped, twenty-four hours to ſettle; then by gentle inclination, pour it from the feces, and keep it well ſtopped for uſe.

ITS operation is cathartic and diuretic. Its doſe is from half a ſpoonful to three or four ſpoonfuls, either by itſelf, or in any convenient vehicle.

" *Elixir Salutis, another Way.*

TAKE of ſtoned raiſins, ſixteen ounces; of ſena-leaves, one pound; of the ſeeds of coriander and ſweet-fennel, ana one ounce. Put theſe ingredients into a glaſs body; pour on them a gallon of *French* brandy, or clean *Engliſh* proof-ſpirit; lute on the head, and digeſt the mixture for three or four days in a gentle heat; then ſtrain the tincture through a fine cloth, for uſe [z]."

Elixir, or Balſamum Polychreſtum, different from that in the London *Pharmacopoeia.*

TAKE of ſarſaparilla, four ounces; china-root and guaiacum [a] raſped, ana two ounces and a half: let the ſarſaparilla and china be groſly powdered; put them into a matraſs, with three pounds of tartarized ſpirit of wine; ſtop the mouth of the matraſs with a little egg, or bolt-head; lute it well, and ſet it on warm ſand to digeſt three days, ſhaking it now and then: then let it cool, pour out the tinged ſpirit, and preſs what you can from the ingredients. Put the tinged ſpirit into the matraſs again, and add to it of gum guaiaci in powder, nine ounces; lute up the glaſs, and let it ſtand in digeſtion three or four days, and ſhake it often every day: then let it cool and ſettle, and pour off the tincture from the ſediment; put the tincture into a clean matraſs, and put to it one ounce of balſam of *Peru*, and half an ounce of balſam of *Gilead*; mix them with the tincture, by much agitation; let them ſtand in digeſtion, as before, three or four days longer, and ſhake them often. When the balſam is well incorporated with the tincture, pour it off clear into a phial, which ſtop and keep for uſe.

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[z] See *Pharmacop. reform.* p. 231.

[a] Two ounces and a half of the ſhavings of guaiacum-wood are certainly a ſupernumerary article in a compoſition where nine ounces of the gum are ordered: and I am afraid, neither the ſarſaparilla, or china-root, have any better claim to a place in this elixir.

It is cathartic and ſometimes diaphoretic. Its doſe is from ten to ſeventy, eighty, or a hundred drops, in any proper vehicle.

To theſe elixirs, there needs no other obſervation, than to make good choice of the ingredients, to lute the joints of the circulating veſſels well, and to moderate the heat, ſo as not to endanger the breaking of them.

" Balſamum Traumaticum, *Balſam for Wounds.*

TAKE of benjamin, three ounces; fine ſtorax in the tear, two ounces; balſam of Tolu, one ounce; Socotorine aloes, half an ounce. Bruiſe theſe ingredients together, and put them in a tall bolt-head, with two pints of rectified ſpirit of wine: digeſt the mixture in a gentle heat for five or ſix days, or till the gums are as perfectly diſſolved as poſſible; then paſs the tincture through a ſtrainer."

Apoplectic Balſam.

TAKE of oil of cinnamon, one dram; of the oil of cloves, lavender, marjoram, and rhodium, ana two ſcruples; oil of rue, one ſcruple; of ambergreaſe, half a dram; of muſk, fifteen grains; of civet, eight grains; of juice of lemons, fifty drops; oil of mace, by expreſſion, and balſam of *Peru*, ana three ounces; of liquid ſtyrax, one ounce: firſt mix them in a marble mortar, afterwards grind them upon a ſtone, till they are entirely mixed; then put the balſam into a wide-mouthed glaſs, tied cloſe with a bladder.

" Balſamum Odoriferum, *an Odoriferous Balſam.*

TAKE two ounces of olive-oil, and as much white bees-wax. Put the oil in a china baſon placed in a copper-pan of boiling water, and ſlice the wax into it. Stir them together with a clean knife, or ſmall ſpatula, till the wax is melted, and perfectly diſſolved in the oil. Then remove the veſſel out of the hot water, and when the matter begins to thicken, drop in four drams of any odoriferous eſſential oil, as that of cinnamon, nutmegs, mace, lemons, rhodium, lavender, roſemary, *&c.* or of a mixture of two or three of theſe oils: to which may be added, one dram of eſſence of ambergreaſe; this quantity will heighten the ſmell of the oils, without giving any of its own. Keep the whole conſtantly ſtirring, that it may perfectly mix: as ſoon as this is done, plunge the veſſel, containing the balſam, into cold water, to prevent any diſſipation of the eſſential oil.

These kinds of balſams may be made of any colour, ſo as to reſemble in this reſpect likewiſe, as well as in ſmell, the vegetable from which the oil you make uſe of was drawn. A little of the pigment, called by the painters ſap-green, being previouſly ground with the oil, will give a fine green, a little vermilion a ſcarlet, ſome turmeric a fine lemon colour, a ſmall quantity of *Pruſſian* blue a violet colour, and a little cochineal will tinge it of a fine purpliſh hue."

CHAP. XXI.

Of OPIUM.

IT is a juice which diſtills from the heads of poppies, by inciſion, found in the kingdom of *Cambaia*, about *Grand-Cairo* in *Egypt*, and *Thebes* in *Greece*. Some tell us of three ſorts, *viz.* black, yellow, and white; but none of theſe come frequently amongſt us, the inhabitants of thoſe countries keeping them for their own uſe, and ſending us the expreſſed juice of poppy-heads, thickened and wrapt up in leaves, for the convenience of tranſportation. It is properly called Meconium: ſuch may be alſo expreſſed from the poppy-heads, which grow in *Italy*, and the ſouthern parts of *France*, but not ſo ſtrong as the former. That which comes from *Thebes* is accounted the beſt. Chuſe that which is black, breaking with a little caſt of yellow, free from ſtubs or leaves, a little acrimonious, of a very bitter taſte, and a diſagreeable ſtupefactive ſcent[b].

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[b] Opium is the milky juice which iſſues from inciſions made in white poppy heads, thickened, in the open air, into a ſolid, but ſoftiſh, reſinous gum, of a dark reddiſh-brown colour, a hot bitter taſte, and ſtrong ſmell.—Opium conſiſts of five parts of gum, four of reſin, and three of earth. Water, wine, vinegar, and brandy, in the proportion of twelve parts of the menſtruum to one of opium, take four or five days for the ſolution without heat; but in the proportion of eight to one, ten or twelve days: alcohol requires a month. Proof ſpirits entirely diſſolve opium. The reſiduum of a ſolution of opium in cold water contains nothing that boiling water can extract. Opium undergoes little alteration in being kept: a dram of freſh and pretty ſoft opium, loſt ſcarcely a grain and a half on being expoſed to the heat of boiling water for five hours. Eight ounces of opium fermented and diſtilled, yielded about three ounces of weak ſpirit, the flavour of which was different from that of opium: the reſinous reſiduum was full as much as if the opium had not been fermented, and retained a little ſmell of the opium, but the extract, made with water, had nothing of it. —A pound of opium yielded, according to Dr. *Pitcairn*, forty-five drams of ſpirit, ten drams of oil, ſixty-two drams of caput mortuum, and ten drams were loſt in the diſtillation. According to Mr. *Geoffroy*, forty-nine drams of ſpirit, nine drams of oil, ſixty-two drams of caput mortuum, loſt ſeven drams; the caput mortuum, calcined to eight drams twenty-five grains, yielded two drams twenty-eight grains of fixed alkaline ſalt; there remained ſix drams ſix grains of earth. According to Dr. *Alſton*, forty-two drams ſix grains of phlegm, one dram fifty-eight grains of volatile ſalt, ſixteen drams of oil, two drams eighteen grains of fixed ſalt, two drams twenty-five grains of earth, and there evaporated in the diſtillation, perhaps of air, nineteen drams fifty-ſix grains, and conſumed of oil, *&c.* in calcination, forty-three drams ſixteen grains. See *Medical Eſſays abridged*, vol. i. p. 132,—158.

Extract of Opium.

PUT four ounces of good opium in thin ſlices, into a glaſs body, in which there are two pounds of ſpring-water; ſet it in ſand, and ſtop the mouth of the body with another glaſs; make fire under it, till by gradual heat, the liquor is made to boil; in which ſtate, keep it two or three hours: then let out the fire, and whilſt the diſſolution is hot, run it through a flannel-bag, and preſs it ſtrongly with your hand into an earthen veſſel; put that which remains in the bag into a matraſs, in which there is a quart of rectified ſpirit of wine; make a double veſſel of the matraſs, and let it ſtand in digeſtion twenty four hours, now and then ſhaking it: then take the matter out, and when it is cool, run it through a flannel, as before: put the ſpirit of wine, which is charged with the reſinous part of the opium, that the water was not capable of diſſolving, into a cucurbit, and in a gentle heat draw off two thirds of the ſpirit of wine, which will ſerve again for the ſame uſe: then put both the extracts together, and in a clean earthen pan, with a moderate fire, and evaporate the liquor till it is of a conſiſtence fit to form into pills, which put up into a gally-pot for uſe.

THIS is the moſt certain anodyne yet known to phyſicians, and is fit for any compound laudanum. Its doſe from half a grain to two or three grains.

THE extract of opium may as well be made with brandy, or proof-ſpirit, as with water and ſpirit of wine; there being water enough in either of them to diſſolve the gummy part of opium, and alſo ſpirit enough to diſſolve the reſinous part: but be careful, in drying it into a ſolid extract, that you do not burn it.

" *Extract of Opium, another Way.*

TAKE of opium ſliced, one pound: reduce it to a kind of pulp, over the fire, with a pint of boiling water, taking great care not to burn it: while it is ſtill warm, tie it up in a coarſe cloth, which put in a preſs between two plates heated in boiling water: force out the pure opium from the dregs; and reduce it, by the heat of the ſun or a hot oven, to its former conſiſtence.

BY this means, the ſmell of the opium will be preſerved, which is loſt by the long decoction ordered in the foregoing proceſs[c]."

Dr. Goddard's *Compound Extract of Opium.*

TAKE of ſaffron and nutmegs, ana one ounce; of caſtor, half an ounce; ſlice the nutmegs and caſtor thin, and put them into a matraſs, with the ſaffron; put to them twelve ounces of tincture of tartar; ſet them in a gentle heat of ſand (with the mouth of the matraſs well ſtopped) in digeſtion twenty-four hours, ſhaking them often: then let them cool, and preſs them through a cloth into a clean earthen pan. What ſtays in the bag, put into the matraſs again, and add to it half a pound of rectified ſpirit of wine; let it ſtand warm twelve hours, and ſtrain it off to the other. Into theſe tinctures put five ounces of the extract of opium, ſet them over a gentle fire to evaporate into an extract.

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[c] See *Pharmacop. reform.* p. 38.

It is a good ſoporific, and alleviates all pains, in what part of the body ſoever. Its doſe from half a grain to three or four grains.

When you put the extract of opium to the tincture of ſaffron, caſtor, and nutmegs, ſtir them well together, till the extract and tinctures be incorporated; and likewiſe be careful to prevent burning the extract.

Liquid Laudanum, with Juice of Quinces.

TAKE two ounces of good opium, one ounce of *Engliſh* ſaffron, and one pound and a half of the juice of quinces; let the opium be thin ſliced, and, with the ſaffron, put to the juice of quinces in a glaſs body; ſome add yeaſt of ale to ferment it; ſet them in a gentle heat of ſand, to digeſt, till the fermentation is over, and the ſaffron ſubſides: then expreſs the juice, and let it ſtand to ſettle; when it is ſettled, pour it off by gentle inclination; put the liquor into a matraſs, and add to it two ounces of cinnamon, one ounce and a half of cloves, and one ounce of *Jamaica*-pepper; let them be bruiſed, and put them into the liquor to ſtand in digeſtion fourteen days: then again expreſs the juice, gently evaporate it to a due conſiſtence, and put it up for uſe.

ITS virtues are the ſame with the former. Its doſe is from ten to forty or fifty drops.

THE yeaſt does often make the medicine muddy, and therefore I ſubſtitute in its place two ounces of juniper-berries, which renders the laudanum more pleaſing to the eye, and takes off its griping quality.

Liquid Laudanum, with Tincture of Tartar.

TAKE of choice opium, two ounces; ſaffron, one ounce; cinnamon, two drams; nutmegs and mace, ana one dram. To theſe ingredients in a matraſs, put twenty-four ounces of tincture of tartar; make the matraſs a double veſſel; lute well the joints, and ſet them in a heat of digeſtion three days, ſhaking them every day: then open the veſſel, and add to the mixture two ounces of juniper-berries, bruiſed; let it ſtand in digeſtion three days longer, then let it cool, and preſs it through a flannel. Put the expreſſed liquor into a cucurbit, and with its head and receiver luted, ſet it over a gentle fire of aſhes: draw off eight ounces of the ſpirit; let that which remains, cool, and decant it gently from the feces, into a phial well ſtopped, which keep for uſe. Its virtues and doſe are the ſame with the foregoing. Of late I put in the juniper-berries with the ſaffron, cinnamon, nutmegs, and mace, and digeſt them three or four days; then preſs them through flannel, decant that liquor, and when ſettled, put to the tincture one ounce, or ſix drams of the extract of opium: incorporate them well, and diſtill off eight ounces of the ſpirit.

Dr. Sydenham's *Liquid Laudanum.*

TAKE of ſelect opium, two ounces; ſaffron, one ounce; cinnamon and cloves powdered, ana one dram; put them into a matraſs, and pour upon them one pint of good canary wine; let the matraſs be fitted for circulation, and ſet them in a good heat of digeſtion for three or four days; then preſs them through flannel: let the liquor ſettle, and by gentle inclination pour it into a clean phial, and keep it for uſe.

ITS operation is the ſame with the foregoing. Its doſe is from ten to forty or fifty drops.

THE canary-wine will endure a ſomething ſtronger heat of digeſtion than ſpirit of wine, or tincture of tartar; becauſe there is not ſpirit enough in the wine to extract the reſinous part of the opium. If after three or four days digeſtion of the other ingredients, you preſs it out, let it ſettle, pour it off by gentle inclination, and then put to it one ounce, or ſix drams of the extract of opium, you will better perform the operation.

Liquid Laudanum, with Sweet Spirit of Nitre.

TAKE two ounces of the beſt opium, which ſlice and put into a matraſs, with one ounce of ſaffron; add to them, one pound of ſpiritus nitri dulcis: invert into the mouth of the matraſs another glaſs; lute it, and ſet it in digeſtion five days, (ſhaking it about every day;) then let it cool, and drop into it (by degrees) one ounce and an half of ſal volatile oleoſum. When the fermentation is over, ſtop and lute up the veſſels again; let the mixture ſtand three days longer in digeſtion: then let it cool, and ſet it inclining to ſettle, and gently decant the laudanum into a phial for uſe.

It is an excellent and certain anodyne, and a great expeller of wind, and ſeldom or never (that I have yet heard of) offends the ſtomach or bowels of the patient. Its doſe is the ſame with the former.

If you add two ounces of juniper-berries to the ſaffron, the medicine will be a greater carminative; and inſtead of crude opium, if you take the extract, and proceed as in the former obſervation, you will the better ſucceed.

Liquid Laudanum, made with the volatile oily Salt.

TAKE four ounces of the extract of opium; put it into a marble mortar; grind it with half a pound of tincture of tartar, which muſt be put to it by two ounces at a time; grind them, till the opium is well mixed with the tincture of tartar; then put them into a matraſs, and put to them one pound of ſal volatile oleoſum, upon which you muſt drop half a dram of ſweet ſpirit of nitre; ſhake them well together, which will produce a little fermentation; when that is over, make a circulating veſſel of the matraſs, lute the juncture well with bladder, and ſet it in a gentle heat of digeſtion ſix days, ſhaking it about every day. Then let the mixture ſettle, and decant it into a clean veſſel, which keep well ſtopped for uſe. It is an excellent laudanum, a certain ſudorific, and a great expeller of wind. Its doſe is from ten to thirty or forty drops.

" *Liquid Laudanum.*

TAKE of pure opium, free from leaves or droſs, or elſe of opium ſtrained, as directed in page 340, two ounces. Cut it into thin ſlices, and put them into a receiver; then pour upon the opium thirty-four ounces by weight of well-flavoured ſmall cinnamon-water, and twenty-four ounces of clean, high-rectified ſpirit of wine: tie a wet bladder over the mouth of the receiver; ſet it in a warm place, and ſhake it every now and then, till the opium is entirely diſſolved; then filtre the ſolution through paper for uſe[d]."

Matthews

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[d] In this liquid laudanum the menſtruum is in ſo large a pro-

portion

Matthews *his Pill.*

TAKE of the extract of opium, of black hellebore, of liquorice, and the corrector, (of ſoap made with ſalt of tartar and oil of turpentine, as before-mentioned) ana four ounces: let the hellebore and liquorice be made into a ſubtile powder; beat and mix theſe four ingredients very well; then with two or three ounces of this maſs, mix one ounce of good *Engliſh* ſaffron, cut into ſmall pieces, and beat them well together, till the ſaffron is perfectly mixed with the maſs; ſo that no part of it is diſcernible from the reſt: then beat and mix that as well with the reſt of the maſs. If the maſs be too dry, you may mix with it ſome of the oil which comes from the ſoap, which it ſpues out when it ſtands a long time, or in its ſtead, ſo much rectified oil of turpentine as is ſufficient to make it into a maſs fit for pills: then put it into a wide-mouthed glaſs, or gally-pot, tied over with a bladder or leather.

IT

portion to the opium, that it eaſily paſſes the filtre, and is not ſubject to precipitate in keeping, as moſt kinds of theſe preparations are, which conſequently renders them very uncertain in point of ſtrength. Its doſe likewiſe may be exactly determined by weight; thirty grains, or half a dram of the ſolution contain one grain of opium. An opiate of this kind ſeems to be greatly wanted in the ſhops, to prevent the neceſſity of the preſent unavoidable method of determining the doſes of this powerful medicine by the uncertain way of drops. See ſeveral further remarks in *Pharmacopœia Reform.* p. 121, and 325.

It is diaphoretic, anodyne and diuretic. Its doſe is from two to five or ſix grains.

Dr. Starkey's *Pill.*

TAKE extract of opium, four ounces; nutmegs and mineral bezoar, ana two ounces; ſaffron and *Virginia* ſnake-root, ana one ounce; beat the nutmegs and ſaffron together into a paſte, ſo that the ſaffron cannot be diſtinguiſhed from the nutmegs: alſo let the mineral bezoar and ſnake-root be in impalpable powder. Then mix all together, with half a pound of the corrector, half an ounce of oil of ſaſſafras, and two ounces of tincture of antimony: let them all be well incorporated, by beating in a mortar; then keep them in a glaſs, or gally-pot, tied over with bladder, or leather, for uſe.

This I had from the ingenious Dr. *Starkey*'s own mouth, in the year 1665, a little before his death; who then told me, he gave *Matthews* the former for a little money; but this is that which he ſucceſsfully made uſe of himſelf. It is both more diaphoretic and a greater anodyne than the former; and I have heard it affirmed by ſeveral gentlemen, who have made uſe of it in their practice, to be the beſt laudanum they ever met with. Its doſe is the ſame with the former. If you diſtill the oil of turpentine with which you make the ſoap, from aromatic herbs and ſeeds, viz. lavender, mint, roſemary, marjoram, caraway ſeeds, and juniper-berries, the laudanum will be more grateful.

Liquid Laudanum with Camphor.

TAKE four ounces of the beſt opium; put it into a matraſs, and pour upon it four quarts of water; place it in a digeſting furnace, and keep it ſcalding hot three days; run it through a flannel, and preſs out all the liquor, which evaporate to one quart; keep it in a bottle to be uſed, as ſhall be directed.

PUT one ounce of choice *Engliſh* ſaffron into a matraſs, and pour upon it ſix ounces of tartarized ſpirit of wine; digeſt them in a gentle heat, till the ſaffron looks pale.

INTO another matraſs put one ounce of cinnamon; of cloves two drams; ginger and pimento, ana one dram and a half; pour upon them alſo ſix ounces of tartarized ſpirit of wine, and digeſt two or three days.

INTO a fourth matraſs put half an ounce of camphor, moiſtened with a little tartarized ſpirit of wine; let them digeſt, till the camphor is diſſolved.

PRESS the tinctures of ſaffron and the ſpirits through flannel, which mix with the diſſolution of opium, and pour all into the matraſs with the diſſolved camphor; let them ſtand two or three days in a gentle heat, and decant for uſe. It is at leaſt equal to other liquid laudanums. The doſe from three to forty drops.

The Drops of Life.

DISSOLVE four ounces of the beſt opium in water, (as in the former proceſs ;) then take one ounce of *Engliſh* ſaffron ; of *Ruſſia* caſtor, one ounce and a half ; cochineal, and *Virginia* ſnake-root, ana half an ounce ; nutmegs, zedoary, ana two drams ; of camphor, one dram : powder theſe ingredients, and put them into a matraſs ; pour upon them of tincture of antimony, (made with ſalt-petre and antimon. diaphoret.) one pound : let them ſtand three or four days in a gentle heat, ſhaking the matraſs often, till a good tincture is produced, which put to one quart of the diſſolution of opium ; then let all ſtand in digeſtion forty-eight hours ; when ſettled, decant. The doſe is from one to forty drops.

A Pectoral Sudorific Laudanum.

TAKE four ounces of the ſoap mentioned in *Starkey*'s pill ; two ounces of extract of opium ; half an ounce of ſaffron ; of ginger, two drams : beat them in a mortar, and add two ounces of balſam of ſulphur aniſated. Grind them, till they are well united, put them into a matraſs, and pour upon them half a pound of ſal volatile oleoſum, and two pounds of rectified ſpirit of wine :

let them digeſt forty-eight hours in a gentle heat, often ſhaking the matraſs; then add ſtrong diſtilled vinegar, four ounces: ſhake the veſſel, and they will ferment a little; when that is over, cloſe the matraſs again, and let it ſtand three days and nights in a gentle ſand-heat, ſhaking it as before: when ſettled, decant the clear, (and you may filtre the ſediment) and put it into a bottle. The doſe is from ten to fifty drops.

The Univerſal Anodyne.

DISSOLVE four ounces of the beſt opium in a ſufficient quantity of water; evaporate it to one pound and a half; to which put one pound of rectified *French* brandy, half an ounce of ſaffron, two drams of cochineal, and two ounces of the tincture of the volatile ſalt of tartar, (or in its ſtead, two ounces of the ſecret corrector;) of ſal volatile oleoſum, and the ſpirit that was drawn from the ſecret corrector, ana three ounces; digeſt theſe for four or five days, in a well-luted matraſs, in a gentle heat: then ſtrain off the tincture for uſe.

THE doſe is from five to fifty drops. It has not only all the common operations of other opiates, but, (as very learned men aſſure me) it very much facilitates the cure of chronic and acute diſeaſes: in ſome caſes you will find it a little cathartic.

CHAP. XXII.

Of HONEY.

IT is the juice of heavenly dew, which falls upon flowers and herbs, and is gathered by thoſe induſtrious inſects the bees, and in them further digeſted. The beſt is of a bright yellow colour, having a pleaſant ſcent and an equal conſiſtence in every part. It nouriſheth, cleanſeth, and opens. It is pectoral and diuretic; cures coughs, and reſiſts putrefaction [e].

Tincture

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[e] Honey is a vegetable juice, elaborated in the flowers of plants, which, exuding, is gathered by the bee, and depoſited in the comb: from whence it is obtained, either by ſimply ſeparating the combs, and then laying them flat on a ſieve, through which the honey ſpontaneouſly percolates; or by including the honey-comb in canvas bags, and then forcing the honey out in a preſs: the firſt ſort is eſteemed the pureſt; the latter is found to contain a good deal of the matter of which the comb is formed, and ſundry other impurities, which the violence of the preſs has probably mingled with it. There is another ſort ſtill inferior to the two above mentioned, obtained by heating the combs before they are put into the preſs. The beſt ſort of honey is white, thick, of an agreeable taſte, and a very pleaſant ſmell. Honey effervеſces with alkaline ſalts, and readily diſſolves in water or ſpirit. Expoſed to a gentle heat, it grows thinner, and throws out a thick, viſcid matter to the ſurface, which being ſcummed off, leaves the honey more tranſparent and pure than before: urged with greater degrees of heat, it yields an acid liquor and an empyreumatic oil, and leaves a ſmall quantity of black matter at the bottom of the diſtilling veſſel, which being burnt in

Tincture of Honey.

TAKE one pound of pure virgin-honey; deſpume it in a clean earthen pan, and put to it three ounces of pure ſalt of tartar, (or any other fixed ſalt) finely pulverized; ſtir them well together, and an ebullition will ariſe; ſtay till it is over, and take off the ſcum, and put the mixture into a cucurbit uncut, and pour upon it one pound and a half of tartarized ſpirit of wine: cloſe the mouth, and ſet it in a heat of digeſtion forty-eight hours. Agitate the matter three or four times a day, and in that time the ſpirit of wine will have charged itſelf with the pureſt part of the honey. Decant it from the feces into a new cucurbit, lute on the head and receiver, and draw off one half of the ſpirit of wine in a gentle heat. That which remains will be a ſweet thick tincture, being an excellent pectoral medicine. Its doſe is from forty drops to two drams.

LET the earthen veſſel you mix the honey and ſalt of tartar in, be capacious enough to contain ſix or eight times the quantity you put into it, otherwiſe the ebullition will be ſo ſtrong, that it will cauſe the matter to boil over.

Spirit

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in the open air, yields an inconſiderable portion of aſhes, in which, upon applying the magnet, iron is found, but upon elixation with water, little or no fixed ſalt.

Spirit of Honey.

MIX one pound of honey, with three pounds of clean ſand, and put it into a retort in a ſand-furnace ; make a fire of the firſt degree for two hours ; increaſe it to the ſecond for two hours more, and ſo on to the third, where let it remain till no more fumes come over or drops will fall. You will find an empyreumatical ſpirit and oil ; put them both into a cucurbit, and with a fire of the firſt degree draw off the inſipid water, and by the ſecond you will raiſe the ſpirit [f].

It is an acid ſpirit, which diſſolves pearl and coral ; and ſome uſe it to procure, or make hair to grow.

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[f] Mr. *Lemery*, in his *Courſe of Chemiſtry*, informs us, that from four pounds of honey he obtained twenty-five ounces of phlegm, and twelve ounces of ſpirit, twenty-ſix ounces of black matter remaining in the diſtilling veſſel, which on being calcined, was reduced to nineteen ounces, and yielded to water one dram and a half of fixed alkaline ſalt. — Mr. *Lemery* the younger (*Mem. de l'Acad. des Scienc. an.* 1706) gives another analyſis of honey. From thirty-two ounces of pure virgin honey, he obtained ſix ounces of a clear watery liquor, called dew of honey, four ounces of yellow phlegm, three ounces of red ſpirit, and two ounces of orange coloured ſpirit ; the black, ſpongy maſs which remained, weighed fifteen ounces and a half, and being urged with a ſtrong fire, yielded ſeven ounces of an empyreumatic liquor, and two drams of a thick, black oil; there remained ſeven ounces and ſix drams of a black coal.

THE ſand is mixed with the honey, to keep it from boiling over; notwithſtanding which, it will ſwell and bubble; and therefore you ought not to fill the retort above half full. In the rectification, fit a receiver without luting; and as ſoon as you taſte any acidity, change the receiver, lute it, and draw off the ſpirit in a heat not exceeding the third degree: and if you add a twelfth, or ſixteenth part of ſpirit of nitre dulcified, it will abate its unpleaſant ſcent.

Sweet Honey-Water.

TAKE of good *French* brandy, one gallon; of the beſt virgin-honey and coriander-ſeeds, ana one pound; cloves, one ounce and a half; nutmegs, one ounce; benzoine and ſtyrax, of each one ounce; vanilloes, number four; the yellow rind of three large lemons. Bruiſe the cloves, nutmegs, coriander-ſeeds, and benzoine; cut the vanilloes in ſmall pieces; put all into a cucurbit, and pour the brandy to them; and after they have digeſted forty-eight hours, diſtill off the ſpirit in balneo mariæ.

To one gallon of this water add of damaſk-roſe, and orange-flower-water, ana one pound and a half; of China muſk and ambergreaſe, ana five grains. Firſt grind well the muſk and ambergreaſe with ſome of the water, and afterwards put all together into a large matraſs; ſhake them well, and let them circulate three days and nights in a gentle heat. Then let all cool; filtre, and keep the water in a phial well ſtopped for uſe[g].

THIS water I often made for King *James* II. It is an anti-paralytic, ſmooths the ſkin, and gives one of the moſt agreeable ſcents that can be ſmelt. Forty or fifty drops put into a pint of clean water, are enough to waſh the hands or face with; and the ſame proportion to punch, or any cordial-water, gives a moſt pleaſant flavour. The honey more powerfully opens the aromatics, which otherwiſe would afford but very little odour.

" *An odoriferous Water.*

TAKE of clean melaſſes ſpirit, two gallons; coriander-ſeeds, one pound; nutmegs, four ounces; of freſh peel of fragrant lemons, the ſame quantity. Bruiſe the nutmegs and coriander-ſeeds, and put them, with the lemon-peel and the ſpirit, into a ſmall pewter ſtill placed in balneo mariæ: tie a thin cloth over the mouth, and ſprinkle upon it five grains of ambergreaſe, and as much muſk in fine powder: lute on the head, and let the whole ſtand

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[g] A well rectified melaſſes ſpirit is preferable to *French* brandy in this compoſition. The honey is of very little, if any ſervice; unleſs it be diluted with a ſufficient quantity of water, and ſlightly fermented along with the other ingredients. The benzoine and ſtorax, in the quantities ordered above, ſcarce communicate any thing worth the expence to the water, and therefore may be well omitted.

ſtand in digeſtion for twelve hours; then diſtill off as much of the ſpirit as a boiling heat of the bath can force over: to this add of freſh, well-ſcented roſe-water, one pint, and half a pint of orange-flower-water; ſhake the whole together."

Oil of Wax[h], *with its Spirit and Butter.*

PUT three pounds of clean warm ſand into a pan; ſlice into it one pound of bees-wax, in ſmall pieces; ſtir it about, that the wax may melt, and mix equally with the ſand: when it is quite cold, put it into a retort, and place it in a ſand-furnace; make fire of the firſt degree one hour; increaſe it to the ſecond, and keep it ſo two hours; and after in the third for three hours, in which time the oil and ſpirit, with ſome of the butter, will be in the receiver, and the reſt of the butter will ſtick in the neck of the retort. You may ſeparate and keep them apart[i].

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[h] Wax is an extraordinary ſubſtance, gathered from the leaves of vegetables, by the induſtry of the bee. It is neither ſoluble in ſpirit of wine, nor in water: boiled in the firſt, it loſes its yellow colour, and becomes white, and of a ſofter conſiſtence: but treated in the ſame manner with the latter, undergoes no change. Diſtilled in cloſe veſſels, it totally ariſes; and ſet on fire in the open air, is entirely conſumed.

[i] From eight ounces of wax Mr. *Lemery* obtained ſix drams of a clear, yellowiſh liquor, and ſeven ounces one dram of butter: the butter being diſtilled a ſecond time without addition, five drams of a clear liquor like the former were ſeparated.

THEIR operation is diuretic. The doſe of the ſpirit is from ten drops to forty or fifty, in any appropriated liquor. The doſe of the oil is from five to twenty-five drops, mixed with ſugar, to make it the better incorporate with liquor. The butter is the ſame. The butter and oil are alſo outwardly applied, and are good to diſſolve tumours.

YOU may mix the wax with three times its weight of quick-lime, eſpecially if you rather deſire the oil than the butter; for the igneous particles of the lime mixing with it, rarefy it more than any other bole; if you deſire to convert all the butter into oil, one or two rectifications from quick-lime will do it, and likewiſe make the oil more penetrating than that made any other way.

A COMPLETE COURSE OF CHEMISTRY.

PART III.

Of ANIMALS.

I Shall here, in this third part, ſpeak only o those animals, and ſuch parts of them, as we make uſe of in chemiſtry; as urine, blood, bones, horns, hoofs, &c. Alſo, ſerpents, vipers, wood-lice, piſmires, &c.[k] And firſt,

CHAP.

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[k] Animal ſubſtances boiled in water, throw out upon the ſurface a liquid oil, or a more groſs fat, which congeals in the cold: at the ſame time a conſiderable portion of them is diſſolved by the water, into a viſcous tenacious liquor, which upon growing cold, forms a tough tranſparent ſubſtance: what remains is an

CHAP. I.

Elixir Cranii Humani.

PUT ſix pounds of human ſkulls (groſly powdered) intoa retort; lute it, and place it in an open furnace; give a degree of fire every two hours, till no fumes are ſeen in the receiver; then let all cool, and take out the ſpirit, oil, and ſalt; the ſalt that adheres to the receiver waſh off with water, and put it to the other; return the whole into a clean retort, and rectify the ſpirit, oil, and ſalt,

an earthy matter. The oil or fat of different animals ſeems to differ only in ſubtility or tenuity of parts: upon expoſing the ſeveral ſorts to the fire in cloſe veſſels, they all yield an aqueous liquor, an empyreumatic oil, ſometimes a ſmall portion of volatile ſalt, and leave behind a black ſpongy maſs; which is reſolved, by the action of fire and air conjointly, into a thick ſmoak, and into a white earthy matter. That part of animals which is ſoluble in water, being diſtilled, yields a large portion of phlegm, ſome oil, and a conſiderable quantity of volatile ſalt, a black matter remaining, like the former. Animals diſtilled entire yield the ſame ſubſtances as their extracts made with water, but in different proportions: the quantity of oil and earthy matter is much larger; but the volatile ſalt much leſs. Animal oils unite with fixed alkaline ſalt into a ſoap, in the ſame manner as thoſe of vegetables. The more liquid ſoon putrify, if kept in a warm place, and then yield, on diſtillation, a notable quantity of volatile ſalt; while the more ſolid are not eaſily changed. All ſorts of animals diſtilled from fixed alkalies, or calces of bones, yield a large quantity of alkaline ſalt: drawn from quicklime, they grow more tranſparent and penetrating, but yield no ſalt.

in a gentle ſand-heat, ſo often (always in clean retorts) till they perfectly unite. Put four ounces of this united ſpirit, oil, and ſalt, into a retort (or cucurbit) with one pound of rectified ſpirit of wine; again rectify all in a gentle heat till they are united, (which five or ſix cohobations will perform) of this put one pound into a matraſs, with two ounces of the moſs of human ſkulls; let them digeſt two or three days; then put the elixir into a glaſs, and ſtop it well.

IT is a noble medicine againſt madneſs, convulſions, and hyſteric fits. It operates by ſweat and urine; and the doſe is from five to one hundred drops.

Diſtillation of Urine.

TAKE of the urine of ſound young men, newly made, as much as you pleaſe: put it into an iron kettle, and evaporate it to the conſumption of one half, in a gentle heat: put the remainder into a ſtone bottle; ſtop it very cloſe, and ſet it by for about two months: then open the bottle; and if you find the matter ſmell quick and ſtrong, put it into a large glaſs retort: lute on a receiver, and give a fire of the firſt degree for an hour; then increaſe it to the ſecond, which will raiſe the ſalt and ſpirit; continue that degree, till you find the ſalt begin to diſſolve, and let all cool. Then take off the receiver, and put all you find there into a cucurbit[1]; ſet it in ſand, lute on its head and receiver, and give a gentle heat at firſt, and the ſalt, and ſome part of the phlegm, which we call ſpirit, will riſe. Continue the fire, till you ſee the head well lined with ſalt; which, when you perceive to decreaſe, let all cool, and put what you find in the receiver into a phial well ſtopped.

It is diaphoretic and diuretic, and given in intermitting and malignant fevers. Its doſe is from five to fifty drops.

As to the evaporation, obſerve to do it by a gentle heat, leſt ſome of the volatile ſalt, by too great an agitation, ſhould fly before the fermentation. The uſe of this evaporation is to ſeparate the phlegm, which would take up too much room to no purpoſe.

If you deſire the ſalt and ſpirit apart, after the rectification, pour off the ſpirit into a phial, and tie a double paper over the mouth of the receiver; ſet it downwards, and let the ſalt drain till it is dry: then ſcrape it off from the ſides with a crooked hoop-ſtick, put it into a phial, and ſtop it cloſe.

If you deſire yet a greater quantity of the ſalt, put both it and the ſpirit together into a long body, lute on the head and receiver, and let it ſtand in a digeſting heat of ſand, that the ſalt may gently ſublime.

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[1] A long-bolled retort is a more convenient inſtrument than a cucurbit.

I have made the ſpirit of urine without fermentation, by evaporating to the conſiſtence of a ſyrup, and giving it gradual fire to the third and fourth degree. In this operation the phlegm comes firſt, and then ſome volatile ſalt; afterwards more volatile ſalt will appear in white fumes, with the ſpirit, and a little ſtinking oil, which muſt be ſeparated from the ſalt and ſpirit before rectification. After one rectification you may ſeparate the volatile ſalt and ſpirit, as in the former; but I do not eſteem it of equal goodneſs with the fermented ſpirit, becauſe all the ſalt of urine is volatilized by the fermentation. In the caput mortuum, as ſome call it, you will find a ſtrong lixivial ſalt; and if the volatilizing fixed or lixivious ſalts, deſerves that encomium the moſt celebrated authors give, the ſalt of fermented urine muſt be the beſt medicine: and indeed there is a perceptible difference betwixt them; the fermented ſpirit and ſalt being more pleaſant and penetrating, both in ſmell and taſte, than the unfermented.

CHAP. II.

Of SOWS, *or* HOG-LICE.

THEY breed in cellars and moiſt places, under ſtones, old caſks, and logs of wood; being touched, they gather themſelves up like round beads. They are ſaid to digeſt, extenuate, open, and cleanſe, and reſolve tartarous mucilage; they are good in the jaundice, colic, ſtone, and difficulty of urine.

The Spirit, Volatile Salt, and Oil of Hog-Lice.

PUT what quantity of millepedes you pleaſe into a long-bodied retort, ſo that it be not above half full; place it in a ſand-furnace; lute on its receiver, and give it the firſt degree of fire, till the retort is throughly hot: then increaſe the fire to the ſecond, in which keep it two or three hours, (according to the quantity of lice) and ſome liquor will drop into the receiver, and the volatile ſalt will begin to riſe: increaſe it to the third and fourth degree; then ceaſe, and take off the receiver, when it is cool, where you will have ſpirit, oil, and ſalt, which you may ſeparate and rectify apart; or put all together into a long-necked matraſs, luting on its head and receiver, and ſeparate the ſalt, by ſublimation, as you do that of vipers. Its operation is diaphoretic and diuretic. Its doſe from ten to fifty or ſixty drops.

You may make the tincture and eſſence of them in the ſame manner as you are directed in the following chapter of ants.

CHAP.

CHAP. III.

Of ANTS.

THESE are wiſe and induſtrious inſects, making proviſion in the ſummer, for their ſupport in winter; obſerving a regular diſcipline in their labour, regimenting their numbers, and as it were conſtituting officers over thoſe that are appointed to work, to ſee its performance. I have with delight and wonder, obſerved them to iſſue out of their hives in order, and, when loaded with proviſion, returning in a continual line, without being joſtled by thoſe which have diſburdened themſelves, and are marching out for more ſtores. This labour they perform in the full of the moon, and reſt in the new.

THEY are black, or reddiſh; in the winter they breed eggs and worms, which in the ſummer become ants; thoſe which breed under trees, and ſmell ſour, are accounted beſt. They are ſaid to provoke venery, and create courage. Some authors uſe their eggs to reſtore hearing.

The Spirit, Oil, and volatile Salt of Ants.

TAKE what quantity of ants you pleaſe; put them into a long-bodied retort, or an uncut cucurbit; let not the veſſel be above half filled with the inſects; fit a recipient, and lute the joint well; give gradual fire, as you did the millepedes, and in all things proceed as in the diſtillation and rectification of them. After you have ſeparated the ſalt by ſublimation, put the oil and phlegm, remaining in the matraſs, into a retort, with a long body; rince out as much as you can of the oil which adheres to it, till it is above half filled with water: place it in a ſand-furnace, and give it a gradual fire, till the water and oil bubble a little; but take care it boil not over; for then your labour will be loſt. If you put a quarter part of ſpiritus nitri dulcis to the oil in its rectification, it will render the oil more pleaſant, and no way hurt its virtue.

The Tincture of Ants.

TAKE what quantity of ants you pleaſe; put them into an uncut body, and put upon them as much oil of nitre per deliquium, as will cover them; let them ſtand in a gentle heat of digeſtion five or ſix days, in which time they will be diſſolved; towards the end of which you may increaſe the fire three or four hours, to make them boil; then let them cool, and pour upon them three times their weight of ſpirit of wine; ſtop the body with a ſmall matraſs, and lute the joint well; let it ſtand in a good digeſting heat, till the ſpirit is well tinged; let that cool, and pour it off, and put on more tartarized ſpirit of wine, and ſet it again in digeſtion, till it has alſo acquired a tincture,

ture, which will be in two or three days time. Decant that tincture to the firſt, and put both into a cucurbit; lute on its head and receiver, and, in balneo mariæ, draw off two thirds of the ſpirit of wine. That which remains in the cucurbit let cool and ſettle, and, by gentle inclination, pour the tincture into a clean dry phial for uſe.

IF the oil of nitre be very ſtrong, the ſpirit of wine will not mix with it, but will ſwim upon it as oil doth upon water, and will only prey upon the animal ſulphur opened by the oil. Remember to ſhake them often while they ſtand in digeſtion.

IN virtue it exceeds that which is attributed to the creature, in every reſpect. Its doſe is from ten to ſixty or ſeventy drops, in a glaſs of canary, or wine and water.

The Eſſence of Ants.

DISSOLVE ants in ſpirit of nitre, in the ſame manner as is directed in making the eſſence of the vipers, ſkim off the froth, and decant it from the feces. To the clear diſſolution of four ounces of ants, put of their rectified oil, four drams, which drop in by half a dram at a time: then put alſo, by little at a time, two ounces of their ſalt. When all is mixed, and the ebullition ceaſed, ſhake them well, and ſet them in a very gentle heat of digeſtion forty-eight hours, in a circulatory veſſel:

then, by gentle inclination, pour off the diſſolution from the feces into a clean cucurbit; to which alſo put a much fixed nitre in powder, by a little at a time, till no efferveſcence appears. Let them ſtand cool and quiet, and in a few hours they will ſhoot into a renovated ſalt-petre. If any liquor remains with the cryſtals, pour it off into a clean cucurbit, with its head and receiver, and, in a very gentle warmth, dry it: likewiſe dry gently that precipitate, which the ſpirit of nitre let fall, when it embraced its own firſt ſalt.

THEN put the renovated nitre, precipitate, and the reſidence of the liquor which was evaporated, all together; grind them in a glaſs or marble mortar, put them into a matraſs, pour upon them one pound of tartarized ſpirit of wine, invert a ſmall matraſs, and lute the joint well, and let it ſtand in digeſtion three or four days, ſhaking it every day once or twice: then let it cool and ſettle, and decant off the tinged ſpirit; and, to the matter remaining, put another pound of tartarized ſpirit of wine: let it ſtand as before, to extract more tincture, and ſo proceed, till it gives no colour to the ſpirit of wine. Then put all the tinged ſpirits into a cucurbit, lute on well its head and receiver, and, in a gentle heat of balneum, draw off three fourths of the ſpirit, which keep well ſtopped, for any ſuch like operation hereafter. That which remains in the cucurbit let cool, and pour it into a clean bottle, which keep well ſtopped for uſe.

THIS is the moſt excellent medicine which is prepared of this induſtrious inſect. Its doſe is from ten to ſeventy or eighty drops.

PLACE the veſſel, in which you make the diſſolution, in ſuch a place where the noxious fumes may evaporate without offence, and continue it there, after you have decanted the liquor from its feces, till you have charged it with the volatile ſalt and oil of the inſects, and alſo with its own fixed ſalt: then ſet it in digeſtion, as the proceſs directs.

CHAP. IV.

Of Spaniſh FLIES.

THEY are a ſort of beetle, of a golden greeniſh luſtre, produced from a worm like a caterpillar. They breed in wheat, the leaves of aſh and poplar. The beſt are found amongſt wheat and in meadows. They abound in *Provence* and *Languedoc*, from whence we are chiefly ſupplied. They are hot and very corroſive, ſeldom uſed inwardly, without good correction.

The Eſſence of Spaniſh *Flies.*

BRUISE four ounces of cantharides; put them into a cucurbit, and pour upon them, by little at a time, twelve ounces of ſpirit of nitre, and let them ſtand in digeſtion twelve hours: then with a glaſs ſpoon, or ſpatula, take off the black ſcum from the ſurface of the ſpirit, which caſt away; pour gradually upon them one pound of tartarized ſpirit of wine; mix them well by ſhaking, and place them in a ſand-furnace: lute on a head and receiver; kindle the fire, which gradually increaſe to the ſecond degree, and in that heat draw off a pound and a half of ſpirit, which keep by you for farther uſe.

To that which remains in the cucurbit, put (by little at a time) ſo much fixed ſalt-petre as will ſatiate its acidity, which you will know by the ceaſing of the ebullition. Then put the mixture into a glaſs or marble mortar; add to it one ounce of refined camphor, and grind them, till they are well incorporated; then return them again into the cucurbit. Rince out the mortar with ſome of the ſpirit of wine which you drew off from the mixture, which pour into the body with the remaining part of the ſpirit; ſhake the whole together well, and ſet it in a heat of digeſtion; make the cucurbit a circulatory; lute the joint cloſe, and let it ſtand in that heat eight or ten days, ſhaking the ingredients well about every day; then let the whole cool, and ſtand to ſettle: pour off the tincture into a clean cucurbit, and, in a very gentle heat, draw off one half, or more, of the ſpirit, which again put upon the mixture, to extract more tincture; and, when that ſpirit is again tinged, draw off two thirds, which put the third time to extract more tincture, and diſtill as before, ſtill putting the tincture remaining, after diſtillation of the ſpirit, to the firſt tincture.

THEN take one dram of ambergreaſe, half a dram of muſk, and two drams of white ſugar-candy; grind them very well together, with a little of the ſpirit laſt drawn off, pour the mixture into a matraſs, and to them add four ounces of the aforeſaid ſpirit; cloſe the matraſs well, and ſet it to digeſt four or five days: then put the matter to the tincture of cantharides, (alſo in a matraſs) and let them circulate together four or five days more; then pour the eſſence into a clean dry bottle, which keep well ſtopped for uſe.

IT is accounted a great cordial, and really is endued with that quality which is attributed to the eſſence of ſatyrion-root. Its doſe is from ten to an hundred drops, in a glaſs of canary wine, or any other vehicle which better pleaſes the patient.

MAKE the diſſolution in a place where the fumes may freely aſcend without annoyance to the operator. The ſame care muſt be taken in mixing the ſpirit of wine with that of nitre; and alſo the ſame caution ought to be uſed in putting the fixed ſalt of nitre to its ſpirit.

THE camphor abſorbs the corroſive quality of the fly; and the fixed ſalt of nitre ſatiates that of the ſpirit: ſo that there is no need to fear any ill conſequence from either. The diſſolution ſubtilizes the fly, and corrects all its poiſonous quality. The diſcharge of the diſſolved particles, by the fixed ſalt, renders it fit to yield its eſſential being to the ſpirit of wine.

CHAP. V.

The Diſtillation of HARTS-HORN.

TAKE that which we call the velvet-head, in the ſpring-time, while it is ſoft; cut it into little pieces, and put them into a cucurbit; lute on its head and receiver; place it in balneo mariæ, and diſtill a water from it.

IT is accounted good to help forward the birth, and to reſiſt malignant humours in fevers. Its doſe is from two to four or five ounces.

The Spirit, Volatile Salt, and Oil of Harts-Horn.

TAKE of that which remained in the cucurbit, (after the foregoing diſtillation) or pieces of ſolid harts-horn, as much as you pleaſe; put them into an earthen retort, or iron pot, either of which may be filled two thirds. If it be an iron pot, you muſt fit to it a copper head, with its receiver; if a retort, only a receiver: place them on a naked fire, which increaſe gradually, ſo as to keep ſome fumes in the receiver, but not to force them ſo violently, as to blow off, or break it. At laſt give the fourth degree, which keep up till no fumes appear: then let all cool, take off the receiver, and put the oil and ſpirit into a ſeparating-glaſs; waſh out the ſalt which remains behind with clean water, and put it to the oil and ſpirit. Then let them ſtand twenty-four hours to ſeparate, and draw out the ſpirit; then put them into a cucurbit, or long-bolled retort, in a gentle heat of ſand to rectify; the ſalt (and ſome part of the liquor, commonly called ſpirit) will firſt aſcend; the ſalt will increaſe, till the neck of the retort and receiver are well charged. When the ſalt begins to diſſolve, take off the receiver, and ſeparate the ſpirit from the ſalt, as before directed in that of urine [m]. If after rectification, any oil appears upon the ſpirit, ſeparate it by a glaſs, and keep the ſpirit in a phial well ſtopped.

IT is diaphoretic and diuretic. Its doſe is from ten drops to forty or fifty, in any proper vehicle.

AFTER the ſame manner we make the ſpirit, oil, and ſalt of human ſkulls and bones, vipers or ſerpents, ivory, hoofs, hair, *&c.*

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[m] From thirty-two ounces of harts-horn, Mr. *Lemery* obtained an ounce and a half of volatile ſalt, ſix ounces of ſpirit, and two ounces of black oil; there remained nineteen ounces of a black coal, which, on being calcined, was reduced to ſixteen ounces.———Harts-horn yields more or leſs of theſe ſubſtances, according as it is more or leſs dry. From five hundred and three pounds of it, I have obtained ſixteen pounds of rough ſalt, and ninety-two pounds of rough ſpirit and oil. Two pounds and three ounces of the ſalt, being rectified with ſpirit of wine, were reduced to one pound four ounces and a half.

If you diſtill any animal ſpirit in an iron pot, with a copper head, that head ought to be kept only for ſuch uſe.

If you would have what we call ſpirit[n] and ſalt[o] free from any appearance of oil, to one pound of the ſpirit (after the ſecond rectification) you may put of bones or horns calcined to whiteneſs, four ounces, and diſtill in a gentle heat of ſand.

If you deſire all the ſalt in a dry form, ſeparated from the phlegm, put the aforeſaid mixture into a matraſs, or long body, with a head and receiver fitted to it, and placed in a very gentle heat of ſand; the ſalt will be elevated into the head and neck of the body or matraſs; for the volatile ſalts of animals are properly their ſpirits; and what we call ſpirit is no other than part of the volatile ſalt, diſſolved in phlegm; which nevertheleſs, has the ſame virtue with the true ſpirit, or volatile ſalt, but may be given in a greater doſe.

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[n] Spirit of harts-horn is moſt conveniently purified by filtring it through a wet paper, (which will retain the oil) and then diſtilling it once or twice with a gentle heat in clean glaſs veſſels. The diſtillation ſhould be continued no longer, than till the volatile ſalt which ariſes, is partly diſſolved.

[o] Salt of harts-horn, and the like ſubſtances, is commodiouſly freed from the offenſive oil which comes over with it, by waſhing it in ſpirit of wine, and then ſubliming it from an equal weight of dry chalk, or fullers-earth.

The Aromatic Spirit of Harts-Horn.

TAKE the ſpirit, oil, and ſalt of harts-horn, after the firſt diſtillation, and rectify them; put them ſo rectified into a clean long-bolled retort: to each pound of which put two ounces of ſal volatile oleoſum, and four ounces of ſpiritus nitri dulcis; ſhake them well together, and ſet them in a very gentle heat of ſand; lute on a receiver, and continue the fire, (not exceeding the ſecond degree) till all is diſtilled. In the receiver you will have a ſpirit which has quitted its empyreuma, and received a penetrating, but very pleaſant ſcent [p]. If you rectify this ſpirit once more, its pleaſant ſmell will be augmented.

CHAP. VI.

Of VIPERS.

THE viper is one of the reptiles, but whether animal or inſect, I diſpute not. The creature is well known, and has a ſkin ſcaly, and withal ſo very compact, that it permits little or no perſpiration of ſpirits, which is the reaſon why it is able to live ſeveral months, without any other nouriſhment than that of air.

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[p] Four pounds of rectified ſpirit of harts-horn, eight ounces of volatile oily ſalt, and one pound of ſweet ſpirit of nitre, yielded five pounds of aromatic ſpirit.

As to the ſtory of *Pliny* about their generation, that the male puts his head into the mouth of the female, which ſhe bites off; that the young vipers pierce the womb and ſides of their dam, and by that means revenge the death of their ſire; of their particular hatred to the aſh-tree, that they will rather run into the fire than come near it, and the like; I reject them as fabulous.

AUTHORS are of different opinions about the manner of emitting their poiſon; ſome aſſerting that it proceeds from the yellow juice which often appears upon the ſurface of the wound; and others from the rage of the animals *. But my deſign being only to give ſuch antidotes and medicines as are produced from them by chemical preparation, I omit all diſputes, as foreign to my purpoſe.

The Diſtillation of Vipers.

TAKE what number of vipers you pleaſe; open and cleanſe them from all worms and excrements, and the females from their eggs; take out their hearts and livers, dry them in the ſhade, ſeparately from the bodies, and when they are dry, cut the bodies into ſmall pieces, and fill therewith a coated retort three quarters full; place it in a reverberatory fit for the retort; lute to it a receiver, which muſt be capacious: cover the furnace with its dome, and give a gentle fire for two hours, in which time the greateſt part of the

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* See this affair ſatisfactorily cleared up in the late elegant edition of Dr. *Mead*'s *Eſſay on poiſons*.

phlegm will come off: then increaſe the fire to the ſecond degree for two hours more, which will raiſe the ſpirit and volatile ſalt; increaſe it ſtill to the third, which will fill the recipient with clouds; keep up this degree, till the clouds leſſen in the receiver. Continue the increaſe of the fire ſtill, to the fourth degree, and keep it there, till all be come over, and the receiver grows cool: then ceaſe the fire, and you will find the phlegm, ſpirit, ſalt, and oil[q], which muſt be rectified as followeth.

SOME take only the bodies, pulling off the ſkin, and cutting off the heads and tails, which they put away; alſo they put away their heart and liver: but all theſe yield as much ſalt proportionable to their weight, as the bodies do. You may as well perform this operation in a good ſand-furnace, and uncoated retort, as you can in a reverberatory.

Rectification of the Salt of Vipers.

PUT all that you find in the receiver into a long-bodied, uncut cucurbit; if more ſalt adheres to the receiver than the liquid which diſtilled from the vipers will diſſolve, put in a little water, and rince all the ſalt out into the body; place the cucurbit in balneo, or a gentle heat of ſand or aſhes;

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[q] Sixteen ounces of vipers yielded one ounce and ſix drams of volatile ſalt, two ounces and three drams of black oil, three ounces of ſpirit, and the ſame quantity of phlegm; there remained in the bottom of the diſtilling veſſel five ounces and two drams of a black matter. See *Lemery*'s *Chemiſtry*.

lute on the head with a bladder daubed with ſtiff ſtarch, and dipt in the white of an egg. You may alſo lute on a ſmall receiver to the beak of the alembic, and the ſalt will ſublime into the head, or upper part of the body, diſtinct from the phlegm, and groſſer part of the oil, which muſt be kept in a clean phial, carefully and exactly ſtopped for uſe.

To this ſalt many virtues are attributed; as that it gives relief even in thoſe diſeaſes which are moſt refractory and difficult to cure; as apoplexies, lethargies, convulſions, palſies, and all other diſeaſes believed to have their ſource in the brain: likewiſe in diſtempers of the breaſt; as difficulty of breathing, palpitation of the heart, pleuriſies, ſwoonings, *&c.* It diſſipates all inward impoſthumes, and diſlodges ſecret and unknown pains, which have their origin in the ſpirits: it helps digeſtion, and purifies the whole maſs of blood; reſolves and prevents coagulations in all parts of the body. It is an excellent remedy againſt all intermitting fevers, particularly quartans: it works powerfully in the diſtempers of the matrix, and is an enemy to all the vices of the ſkin, even to the leproſy itſelf. But above all, it is a moſt certain ſpecific againſt the bitings of all venomous creatures. It is alſo a great antidote againſt the plague, and all contagious and epidemical diſeaſes; as the meaſles, ſmall-pox, *&c.* Its doſe is from ten grains to two ſcruples, in any proper vehicle.

THIS excellent ſalt is alſo another ingredient in the anti-rheumatic tincture.

IF you deſire the ſalt more nicely ſeparated from all the oily particles which it carried with it in the firſt rectification, mix three parts of clean and very dry chalk, in fine powder, with one part of the rectified ſalt of vipers: put it into a matraſs, or uncut cucurbit, with its head and receiver well luted; and with a gentle fire ſublime the ſalt, and it will leave all the oily particles abſorbed in the chalk.

A Sudorific Water of Vipers.

TAKE what number of live vipers you pleaſe; put them into a ſtrong earthen body; tie a hair-cloth over its mouth (ſuch as coarſe hair-ſieves are made of;) fit and faſten a head well to it; then place it in balneo, which gradually make to boil. This will elevate a water, which you will ſee drop into the receiver: when the drops ceaſe to fall, let it cool, and take out the water.

ITS operation is diaphoretic, and it is ſucceſsfully exhibited in many caſes, where the ſalt is proper. Its doſe is from twenty to ſeventy or eighty drops, in any proper vehicle.

THE hair-cloth is faſtened to keep the vipers from jumping into the head, when they begin to be heated; by which means they may poſſibly break the head, and get out; whoſe biting then would be extremely pernicious, by reaſon of their irritation by the heat of the fire.

The Eſſence of Vipers.

TAKE of dried vipers, what number you pleaſe; cut them into ſmall pieces, and put them into a cucurbit; place it conveniently, and pour into it (by a little at a time) ſo much ſpirit of nitre as will diſſolve them: (commonly twelve ounces of ſpirit of nitre will diſſolve four ounces of vipers.) When all the ſpirit is put upon them, let them ſtand five or ſix hours, and there will ariſe a black ſcum upon the ſurface of the diſſolution, which muſt be taken off with a glaſs ſpoon, or, in defect of that, a clean tobacco-pipe. You will likewiſe find white feces in the bottom, which muſt alſo be ſeparated from the clear diſſolution; pour the clear liquor into a retort, and by an ounce or two at a time, put to it three times its weight of tartarized ſpirit of wine, ſhaking them often about, as you mix them: place the retort in a heat of aſhes, and with a gentle fire diſtill off the ſpirit of wine, which will be an excellent dulcified ſpirit of nitre: To the black matter remaining in the bottom of the retort, put the ſame quantity of new ſpirit of wine tartarized, and diſtill it off as you did the other: put on again the ſame quantity as before, and diſtill in the ſame manner; and repeat this ſo often with new ſpirit of wine, till it has neither any nitrous ſmell, nor acid taſte. Keep that which remains in the retort, to unite with the volatile ſalt, and rectified oil of vipers, as in the following proceſſes.

WHEN you put the ſpirit of nitre to the vipers, place the veſſel where the fumes may aſcend without offending you: alſo be careful not to put above one ounce of the ſpirit of wine to the ſolution, leſt the ebullition ſhould be ſo ſtrong, as to make the matter fly out of the veſſel with violence *.

The Rectification of the Oil of Vipers.

PUT the oil and phlegm from which the ſalt of vipers was ſublimed, into a cucurbit, capable of holding two gallons; pour to them one gallon of clean water; ſet the cucurbit in a ſand-furnace; fit to it a head and receiver; give it a gradual fire, till the matter within the body bubbles; continue the fire ſo, till holding a ſpoon under the beak of the head, you perceive very little or no oil to ſwim upon the water, which drops into the ſpoon. Then let all cool, and you will have water, with the æthereal oil of vipers, in the receiver.

ONE gallon of water will be ſufficient to rectify four ounces of the black oil with, and generally by that time you have diſtilled two quarts of water, you will have all the æthereal oil come over.

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* If you put the ſolution by little and little to eight times the quantity of ſpirit, you will avoid the danger here hinted at, and at the ſame time finiſh this proceſs at one ſingle diſtillation.

The Compound Tincture of Vipers.

TAKE one pound of flowers of ſulphur; four ounces of crude antimony; grind them to a fine powder; put it into an earthen diſh, and ſaturate it with four ounces of oil of ſulphur per campanam, (or with oil of vitriol:) put the matter into a retort, and pour gradually one pound of ſweet ſpirit of nitre upon it; place the retort in a ſand-furnace, and draw off the ſpirit. Into one pound of this ſpirit put two ounces of dried vipers, (cut into ſmall pieces;) let them digeſt forty-eight hours in a matraſs; when cool, ſtrain the liquor through a hair-cloth. Return the menſtruum into a matraſs, adding cochineal, ſaffron, and *Virginia* ſnake-root, of each two drams. Let them digeſt forty-eight hours, and then decant the clear tincture.

IT is an excellent diaphoretic. In the year 1665, I have known it often given with ſucceſs in the plague, as well as in malignant fevers. The doſe is from five to fifty drops.

The Union of the Volatile Salt, Æthereal Oil, and the moſt ſubtile Parts of the Viper into an Eſſence.

PUT to four ounces of the diſſolved body of the vipers left in the retort, one ounce of tinctura regalis, (before mentioned in the chapter of antimony) by a dram at a time: then to two ounces of the ſalt, and half an ounce of the æthereal oil, put one pound of the ſame tinctura regalis; put them into a matraſs, which make a circulatory, and let them ſtand ten days in the ſun, (or an equivalent heat) ſhaking them every day. When you ſee the tincture has imbibed all the ſalt and oil, take it out, and put it to the diſſolution of the vipers aforeſaid; and when by a ſtrong agitation you have looſened the diſſolution from the retort, put it all into a matraſs, and let it circulate in a very gentle heat ten days, ſhaking it every day. In this time all the ſeveral ſubſtances will be united into an eſſence, which pour off from the feces into a clean phial, and keep carefully ſtopped for uſe.

THIS eſſence is endued with all the virtues of the ſalt of vipers; and if any animal medicine exceeds the ſalt, it is this. Its doſe is from twenty to one hundred drops, in any appropriated liquor.

THE ounce of tinctura regalis is put to the diſſolved vipers to ſatiate (in part) the acidity ſtill remaining in them, which otherwiſe might too much fix the ſalt of vipers, and reduce it to the nature of common ſalt armoniac *; which being again mixed with fixed alkalies, may be ſublimed into an animal urinous ſalt, as it was before.

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* The ſalt which reſults from a ſolution of vipers in ſpirit of nitre, more perfectly reſembles nitre than ſal armoniac.

You may likewiſe dulcify the diſſolution, by putting to it (by little at a time) as much pure fixed nitre as will ſatiate its acidity: then let it ſtand in a cold place, and it will ſhoot into a combuſtible ſalt-petre again; and the diſſolution will be thereby freed from the corroſive ſpirit of nitre, which would have changed the volatile ſalt, into that which ſome call the ſecret ſal armoniac.

Whatever animal, vegetable, or mineral, is diſſolved in the ſpirit of nitre, it will be made to precipitate with the fixed ſalt; and on the contrary, whatever is diſſolved in the oil of nitre per deliquium, or by its fixed ſalt, will be ſeparated by the ſpirit: and this (if carefully elaborated) may be done without prejudice to the matters diſſolved, and to the augmentation of their virtues, by digeſting and ripening their undigeſted crudities.

CHAP. VII.

To elixirate, or make eſſential animal volatile ſalts.

Take half a pound of volatile animal ſalt; put half a pound of tartarized ſpirit of wine to it, and it will coagulate, and is that which *Helmont* calls his offa alba: put this ſalt into a matraſs, pouring upon it pure and ſtrong diſtilled vinegar, by little and little at a time, till the ebullition ceaſes; then ſet the matraſs in a gentle heat of ſand, with its head and receiver well luted; there will firſt come a ſubtile liquor, dropping from the noſe of the alembic; after that will ſublime into the head, a moſt glorious ſalt, white as ſnow, in figure like large flowers of benzoine, of a quick, pleaſant, penetrating ſcent, and a very agreeable taſte.

IN this operation you muſt have a watchful eye; as ſoon as you perceive the cryſtals to fall, or relent in the head, draw the cucurbit out of the ſand, and take off the head and receiver; put the ſpirit and ſalt apart, into phials, and carefully ſtop them. In the cucurbit you will find a very ſtinking phlegm, which may be thrown away.

THIS is that animal ſalt I unite with the ſalt of tartar, that ſo readily diſſolves in tartarized ſpirit of wine, before-mentioned; with which I extract the anodyne ſulphur of metals, and of them compoſe that ſurprizing anti-rheumatic tincture, which rectifies loſt and depraved appetites, reſtoring the ſtomach to its true tone, and preparing the aliment for further digeſtion; cleanſe the blood of all the corroſive ſalts, which (in ſome meaſures) occaſion thoſe acute pains in rheumatiſms, gouts, ſcurvies, *&c.* It is a powerful diuretic, and of excellent uſe in the ſtone and gravel, either in the kidneys or bladder, by diſſolving and waſhing off that petrifying matter, which is the cauſe of both. By its gentle diaphoretic and anodyne quality, it quiets the *Archæus*, and allays the irregular ferment in the blood; by which means it becomes an excellent medicine in all fevers; and by its carminative and ſweetening quality, gives preſent relief in colics, and all gripings in the bowels and ſtomach. In its taſte and operation, it is moſt pleaſant, and mixes with all liquors, without ebullition, coagulation, or precipitation. So much for the anti-rheumatic tincture.

THIS eſſential animal ſalt is diaphoretic and diuretic. Its doſe is from five grains to one ſcruple.

THE doſe of the anti-rheumatic tincture is from fifty to one hundred, or one hundred and twenty drops. My common vehicle is ſpring water.

CHAP. VIII.

Of SALT ARMONIAC.

SALT armoniac is brought from *Alexandria* in *Egypt*, *Venice*, *Antwerp*, &c. and is either natural or artificial. The natural is found in very hot countries, where the earth has imbibed the urine of animals; but of this very little is brought to us. The artificial is made of ten pounds of urine, two pounds of ſea-ſalt, and one pound of the ſoot of wood: theſe are boiled into a maſs, and then ſublimed into ſuch cakes as come to us[r].

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[r] The ſal armoniac of the ſhops is an artificial ſaline concrete, ſaid by ſome authors to be prepared from a mixture of urine, common ſalt, and wood-ſoot; by others, (ſee *Mem. de l'acad.*

Purification of Salt Armoniac.

DISSOLVE what quantity of ſal armoniac you pleaſe in warm water; filtre and coagulate, or only evaporate to a pellicle, and ſet it to

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l'acad. des ſcienc. an. 1735.) to be ſublimed from the ſoot of cow-dung. It is ſoluble in ſomewhat leſs than double its weight of water: the ſolution, being duly evaporated, ſhoots into thin fibrous plates like feathers. Sal ammoniac neither coagulates milk, nor changes the colour of ſolution of ſublimate. It makes a conſiderable effervescence with the vitriolic acid, attended with a notable degree of cold. Expoſed to a conſiderable heat, it totally ſublimes; and, if previouſly well ground with metallic, and certain other ponderous ſubſtances, elevates ſome part of them along with itſelf, and concretes with the reſt into a maſs, which readily flows into a liquor in a moiſt air. Mixed with a due quantity of fixed alkaline ſalts, it yields to a ſmall degree of fire two thirds its weight of pure volatile alkali: what remains in the ſubliming veſſel, being diſſolved in water and cryſtallized, readily aſſumes the form of cubical cryſtals, like thoſe of common ſalt, the properties of which it likewiſe poſſeſſes, (ſee page 209.) Sal ammoniac, mingled with nitre, and injected into a red hot crucible, boils up, and emits flaſhes of light; and thus betrays its animal origin, (ſee the chemical hiſtory of animals, page 358.) Sublimed in a retort, with double its weight of chalk, it is ſaid to gain an increaſe; (ſee *Mem. de l'acad. des ſcienc. an.* 1735.) but the ſubſtance thus elevated, is not to be regarded as a pure volatile ſalt; ſince, probably, one third of the quantity is owing to the chalk. A mixture of quick-lime and ſal armoniac ſet to ſublime, affords an exceeding penetrating ſpirit; but gives over nothing in the form of a ſolid ſalt: if the quantity of lime be conſiderable, the volatile alkaline part of the ſal armoniac is almoſt totally abſorbed by it.

to ſhoot in a cold place; either of them will render you a very white ſalt.

ITS operation is ſudorific and diuretic; it is ſaid to be good in malignant fevers; alſo in quartan agues; it provokes womens terms, reſiſts putrefaction, and is therefore given in the time of the plague. Its doſe is from twenty grains to one dram and a half.

THIS operation ſeparates the accidental dirt from the ſalt, and renders it fit for ſublimation. If without this ſeparation, you ſhould ſublime it, the foul and dirty ſulphur would riſe with it, and render it unfit for ſome curious operations.

Sublimation of Salt Armoniac.

PUT what quantity of ſalt armoniac (in groſs powder) you pleaſe into a retort, or matraſs, with its head; place it in a ſand-furnace, fit a receiver to it, and give gradual fire to the third degree, in which you may keep it till all is ſublimed, which you will perceive by the ſublimate riſing clear above the ſand. Some ſublime it with common ſalt, and others with burnt-alum; but they ſerve for no other uſe than taking up room in the glaſs, which muſt not be quite half full. Salt armoniac being ſublimed with common ſalt, is that which Mr. *Lemery* calls flowers of ſalt armoniac [s]. Its uſe is the ſame with the purified.

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[s] By ſubliming eight ounces of each together, he obtained ſix ounces of flowers.

Spirit of Salt Armoniac, with Salt of Tartar.

TAKE of ſalt armoniac, and ſalt of tartar, of each one pound; powder and mix them well, and put them preſently into a cucurbit, (or rather into a retort, becauſe there is but one joint to cloſe;) ſprinkle the mixture with twelve ounces of phlegm of wine, or eight ounces of ſpring, or rain-water; place the veſſel in ſand, and luting well the receiver with bladder, give a fire of the firſt degree one hour and a half; increaſe it to the ſecond, and keep it ſo for two hours: go on to the third, and keep it there, till you ſee the ſalt begin to diſſolve in the neck of the retort, or head of the cucurbit. Let all cool, and put the ſpirit into a phial by itſelf, and the ſalt into another by itſelf[t].

ITS operation is ſudorific and diuretic. It is given in epilepſies, palſies, the ſmall-pox, malignant fevers, and the plague. Its doſe is from ten drops to one dram.

INSTEAD of a pound of ſalt of tartar, you may take one pound and a half of pot-aſhes, made clean by diſſolution and filtration, and evaporate it to dryneſs. It is of the ſame uſe with ſalt of tartar.

Spirit

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[t] Eight ounces of ſal armoniac, the ſame quantity of ſalt of tartar, and five ounces of water, yielded Mr. *Lemery* ſeven ounces and a half of ſpirit; after which ten drams and a half ſublimed.

Spirit of Salt Armoniac, with Quick-lime.

TAKE of ſalt armoniac, in fine powder, one pound; of quick-lime, (which has lain in the air, till it is broken into fine powder) three pounds; mix them well, and put them preſently into a retort, to which put two pounds of river, rain, or ſpring-water; ſhake it, to mix the powder and water, and place it in a ſand-furnace. Lute well the juncture of the receiver, and give fire of the firſt degree one hour and a half; augment it to the ſecond, where you may keep it, till about twelve ounces of ſpirit be diſtilled: then take off the receiver, and keep the ſpirit in a phial well ſtopped for uſe[u]. You may lute on the receiver again, and draw off three or four ounces more, which will be pretty ſtrong.

ITS operation, uſe, and doſe, are the ſame with the other. It is accounted the better ſpirit to ſmell to, being more penetrating; but, by reaſon of its heat, it is not thought ſo good for internal uſe.

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[u] Eight ounces of ſal armoniac, diſtilled with thrice its weight of quick-lime, and four ounces of water, yielded five ounces and ſix drams of ſpirit; there remained in the retort thirty ounces of a white matter, which being boiled in a large quantity of water, and then evaporated to dryneſs, gave ſix ounces and a half of a cauſtic alkaline ſalt. See *Lemery*'s *Chemiſtry*.

IF the lime be not a little quenched before it is mixed with the ſal armoniac, the ſpirit will fly with ſuch violence, that it will be very troubleſome to put it into the veſſel, and the moſt eſſential part will be loſt.

The Spirit and volatile Salt of Sal Armoniac, which Monſ. Lemery *calls ſweet Spirit of Salt Armoniac.*

TAKE ſalt armoniac, and ſalt of tartar, of each one pound; make them into fine powder, and mix them; put them into a cucurbit, fit a helm to it, with a wide beak, and likewiſe a receiver to the helm; lute them well with bladder dipt in the white of an egg, well beaten with a little water; place them in a ſand-furnace, and give fire of the firſt degree two hours; the ſalt will riſe into the head, and ſome ſpirit drop into the receiver. Raiſe the fire to the ſecond degree, and keep it ſo four or five hours, in which time all the volatile ſalt will be ſublimed. Let all cool, and take off the head and receiver; put the ſpirit into a phial well ſtopped, and the ſalt into another alſo well ſtopped. If you would have the ſalt converted into ſpirit, it is done by three or four rectifications.

IT is of the ſame uſe with the other ſpirit of ſalt armoniac, and may be given in a greater doſe.

If you put half a pound of tartarized ſpirit of wine to the ſalts before diſtillation, you will have a greater quantity of ſalt than can be produced without it.

The acid ſpirit of Salt Armoniac.

TAKE the caput mortuum of the former ſpirits, one part; and of fullers earth three parts, both beaten into fine powder, and well mixed; put them into an earthen long-neck, and place it in a reverberatory; fit and lute on the receiver; make fire of the firſt degree for one hour; increaſe it to the ſecond, and keep it there three hours longer, and ſo to the third and fourth, till the receiver becomes clear without fumes: then let all cool, take off the receiver, and put up the ſpirit for uſe. It is of the ſame nature and uſe as the ſpirit of common ſalt, *&c.*

This is the ſpirit of common ſalt, which was before in the compoſition of ſalt armoniac, but kept down by the ſalt of tartar; and therefore requires as ſtrong a fire to diſtill it as that of common ſalt.

The diuretic Salt.

TAKE the grey ſalt which remains in the veſſel after diſtillation of either of the ſpirits made with ſalt armoniac and tartar; diſſolve, filtre, and evaporate, either to a pellicle, (and ſo ſet it to ſhoot into cryſtals) or to a dry bottom.

ITS operation is diuretic and diaphoretic. It works by urine very powerfully, from which it takes its name. It is given in the ſtone and gravel, alſo ſucceſsfully in intermitting fevers. Its doſe is from ten grains to one dram, in any proper vehicle.

IF after the humidity is evaporated, you make too ſtrong a fire under it, you will burn and diſcolour the ſalt.

Sal Volatile Oleoſum.

TAKE of ſalt armoniac and ſalt of tartar, of each half a pound; powder them apart, and mix them: put the mixture into a retort; put alſo into the retort half an ounce of marum Syriacum; and of tartarized ſpirit of wine, one pound and a half, impregnated with the following eſſential oils, *viz.* of cloves, half a dram; cinnamon, one ſcruple; marjoram, lemons, and oranges, of each one dram; put to them of clean water, two pounds, and ſet all in a ſand-furnace: lute on the receiver, and give fire of the firſt degree one hour and a half; increaſe to the ſecond, in which continue it five or ſix hours, or until you have in the receiver about a pint and a half of ſpirit and ſalt. You may aromatize it with eſſence of ambergreaſe to your pleaſure.

This medicine is differently compoſed, as the operator pleaſes. Its operation is diaphoretic and diuretic. It is given in pains and diſeaſes of the head. It is good in palſies, lethargies, ſcurvy, and peſtilential fevers. Its doſe is from ten to ſixty drops.

If you make it with the ſpices and herbs, inſtead of the eſſential oils, it will acquire a little tincture, which by ſome is diſliked, but I think it not the worſe.

" *Sal Volatile Oleoſum, another way.*

TAKE pure, clean ſalt ammoniac, and pearl-aſhes, both in powder, of each one pound: diſſolve the ſal ammoniac in about twice its weight of water, and as much of the fixed alkaline ſalt as equal its weight of water will take up: paſs the latter ſolution through a cloth, and pour them both ſeparately into a ſtrait, wide-necked retort. Diſſolve half an ounce of oil of lemon-thyme, and one dram of oil of pimento, in three pints of clean, well rectified ſpirit of wine: then add it to the former ſolutions. Place the retort in a ſand-furnace: lute on a receiver with a wet bladder; and apply a very gentle fire, till the ſalt (which will be elevated to the neck of the retort, and the ſides of the recipient) is partly diſſolved: then put out the fire; and when all is cool, pour the ſpirit into a phial for uſe.

" *Sal Volatile Oleoſum, another way.*

TAKE eſſence of lemons, chemical oil of nutmegs, of each two drams; chemical oil of cloves, half a dram; ſweet ſpirit of ſal armoniac, two pounds. Put them into a retort placed in a water-bath; and diſtill as much as a boiling heat will elevate [w]."

" *Extemporaneous Sal Volatile.*

TAKE of pure alcoholized ſpirit of wine, and of ſpirit of ſal armoniac made with tartar, fully ſaturated with ſalt, of each half a pound: drop into the ſpirit of wine one dram and a half of any eſſential oil, and it will immediately mix with it: mingle the two ſpirits together, and they will form a white coagulum, which in a little while will depoſite a conſiderable portion of a fine white ſalt; a tranſparent liquor, ſomewhat tinged with the colour of the oil you have employed, floating upon the top."

The hidden Spirit of Salt Armoniac.

TAKE of pure ſpring-water, five pounds; pot-aſhes, two pounds; ſalt armoniac, one pound; put them into an uncut body, and ſtop it with a bolt-head, firmly luted: let them ſtand three or four days in a gentle heat of ſand to digeſt, ſhaking them two or three times every day: then let the mixture ſettle; filtre, and keep the water for uſe.

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[w] Particular care ſhould be taken in the choice of the oils, which are very liable to adulteration; for upon their goodneſs the excellence of this preparation in great meaſure depends.

It is uſed to open obſtructions of the liver and ſpleen, provoke the terms, ſweeten the blood, and to give eaſe in the gout. Its doſe is from forty to ſixty, or one hundred drops.

You may diſſolve and filtre the ſalts apart, and then put the diſſolutions together, into a glaſs big enough for the liquor to circulate in.

The double Menſtruum of Salt Armoniac.

TAKE of ſalt armoniac and quick-lime, both reduced into fine powder, of each equal quantities; mix them together, and let them run, per deliquium, in a moiſt place.

This liquor is of the ſame uſe with the foregoing ſpirit. Its doſe is from ten drops to one dram. It readily diſſolves mercury ſublimate into a clear water, which may be of uſe to the curious.

Let the lime be two or three days expoſed to the air, before you mix it with the ſal armoniac; otherwiſe a great part of the volatile ſpirit will evaporate, which ought to be united with the ſalt.

PART

PART IV.

By WAY of

APPENDIX.

Of the Tranſmutation of Metals.

THE doctrine of the tranſmutation of metals has been poſitively aſſerted by many authors, both antient and modern; by men of great learning and experience, of ſolid virtue and piety; of which (amongſt others) the late honourable Mr. *Boyle* is, I think, a complete inſtance.

I know indeed that this doctrine meets with very little acceptance amongſt the learned of this age, neither ſhall I pretend to be an advocate for it, though the expenſive and tedious experiments I have made, abundantly convince me, that metals may be very much meliorated, if not entirely tranſmuted.

The following experiments, which I have choſen out of many others, I faithfully deliver to you; hoping that I have ſo behaved myſelf, that my veracity will not now be queſtioned; and that I ſhall not, upon the brink of fourſcore, be accuſed of vanity.

The ætiology of any thing in theſe or the former proceſſes, cannot be expected from me, who want the great bleſſings of academical education, and have no more philoſophy than (I may truly ſay) I have fetched out of the fire.

I affect no unintelligible words, or myſtical hieroglyphicks, to delude men of their money and ſenſes too. I honeſtly relate only matter of fact, which may caution you againſt thoſe circumforaneous pretenders, the adepts, who have prejudiced the world by their cheats; and, notwithſtanding the fair warning *Eraſmus* long ſince gave us, continue to impoſe upon ſome great and wiſe men.

Experiment I.

THE fifth day of *Auguſt*, *A. D.* 1661, Mr. *T. T.* joined with me in the making the mercurial water following.

We had a caſt-iron body three foot long, with a perforation within half a foot of the top; we made an agreeable furnace, and placed the body in it, to which we luted a large glaſs head, with a very wide beak; to which alſo we luted ſeven aludels.

dels. When the bottom of the body was of a white heat, we put in at the perforation, two or three drops of mercury, and immediately ſtopped it cloſe. This little quantity of mercury made a great noiſe, and roſe in white fumes, which filled the head, all the aludels, and the receiver. When theſe fumes were condenſed, we put in the like quantity as before, and ſo continued, till in ſixteen hours time we had put in one pound of mercury. When all was cold, we took off the receiver and aludels; in each we found a little water, and in the firſt and ſecond aludel ſome grains of crude mercury; we carefully put all the water together, which ſeemed to be about one pint, and yet the weight was but thirteen ounces and ſix drams.

WE pleaſed ourſelves wonderfully with our ſuppoſed treaſure, which we concluded could be no leſs than the univerſal menſtruum; but, after many trials, we found it of no more virtue than common water. We ſpent above half of it upon leaf gold, gold calcined with mercury, and upon a lunar calx, *&c.* but the more experiments we made, the more we were convinced that our mighty expectations were vainly founded; however, we divided the remaining water; and I loſt my part when the fire of *London*, *A. D.* 1666, forced me to remove.

THE ſame gentleman and I tried many experiments with air attracted by ſeveral magnets;

with *May*-dew, and other inſipid menſtruums, *&c.* and we never found them more uſeful than diſtilled rain-water.

Experiment II.

THE fourteenth of *June*, *A. D.* 1667, I purified regulus martis to a perfect ſtar, of which I melted four ounces, with half a pound of fine ſilver; I beat it, when it was cold, into a fine powder, and then, with twenty-four ounces of mercury revived from cinnabar, I ground it in an iron mortar, till they were truly amalgamated.

The 16th. This whole day was ſpent in grinding the amalgama with warm water, till the water came off clear.

The 17th. I put the amalgama into a retort, which I ſet in ſand, and gave it fire gradually; but the laſt four hours I kept it in the extreme degree.

The 18th. I again melted the luna with four ounces of the ſtellated regulus; then beat into fine powder, and by grinding with it the diſtilled mercury, I made an amalgama as before.

The 19th. I waſhed and ground the amalgama in warm water.

21st. It was diſtilled.

THESE operations I repeated ten times, always melting four ounces of freſh regulus with my luna.

THE 8th of *July*. I weighed my mercury, and found it twenty ounces and ſix drams: I boiled it in diſtilled vinegar, and ſtrained it through fine clean cloths, till it was dazling bright.

THE 9th. I put two ounces of this mercury, and ſix drams of perfect fine gold into a little uncut body: I ſet it into my athanor, where it continued ſix days in a gentle heat; in which time the mercury had ſo penetrated the gold, that in leſs than ſix hours time I ground them into an amalgama, which I waſhed, till it was very bright; then I put it upon a ſheet of fine white paper, and ſet it in a gentle heat of my athanor to dry.

THE 19th. I put the amalgama into a ſtrong cryſtal egg, which I ſealed hermetically, and placed it in my athanor, gradually giving fire for fifteen weeks; then the bottom of the pan in which it ſtood was red-hot. It endured this heat four days, and then burſt into ten thouſand pieces, ſo diſperſed, that I never could find one grain of it.

N. B. After the amalgama had ſtood three weeks in the firſt degree of heat, it turned a little black. Six or eight days after, it divided (as it were) into little iſlands. Eight or ten days after that, it began to vegetate, and grew daily from little ſhrubs to trees; firſt with buds, then leaves, and laſtly with little round knobs like fruit, which I beheld with much pleaſure, though I paid dear enough for it.

Experiment III.

THE tenth of *October, A. D.* 1677, I bought of Mr. *Willmore* the refiner, five pounds of mercury, (which he had diſtilled from various metals; I diſtilled it alſo from ſcoria of mars and ſulphur three times, and twice per ſe; after that, ſeven times from regulus of mars and venus, in the proportions following.

THE 20th. I took ſix ounces of pure regulus of mars and venus; of fine ſilver, twelve ounces; of the mercury, three pounds: I ground the regulus into a fine powder.

THE 21st. By grinding I made an amalgama of the regulus and mercury, and waſhed it pure with clean warm water.

THE 22d. I diſtilled it.

THE 24th. I melted the ſilver with ſix ounces of new regulus, and reduced it to powder.

THE 25th was ſpent in grinding them into an amalgama, and waſhing it as before.

THE 27th. I diſtilled the mercury, and I afterwards repeated all theſe operations ſeven times.

THE 14th of *November*. I diſtilled the mercury from ſcoria of mars.

THE 15th. I ſqueezed it through leather, boiled it in diſtilled vinegar, and often ſtrained it through fine cloths, and put it into a bottle. The mercury then weighed two pounds, ſeven ounces, and a half; it having waſted, in the ſeveral operations, eight ounces and a half.

THE 18th. I put ſix ounces of this mercury, and two ounces of fine gold into a little uncut body, and let it ſtand ten days in a gentle heat of my athanor.

THE 28th. By grinding, I made an amalgama of them, which I boiled in diſtilled vinegar, and found the vinegar received a blackiſh tincture; then I waſhed it in warm water, and dried it firſt with clean cloths, and afterwards upon the top of my athanor.

THE 29th. I put it into two ſtrong cryſtal eggs, which I ſealed hermetically, and placed in my athanor.

THE 23d of *November*. I diſſolved two pounds of mercury in aqua fortis, (made of alum and nitre) which I precipitated with filings of lead. Some will affirm this to be the mercury of ſaturn; but I muſt crave leave to diſſent from them.

THE 25th. I diſtilled this mercury from clean filings of iron.

THE ſame day I melted four ounces of regulus veneris, with eight ounces of fine ſilver; brought it into powder, of which, by grinding with twenty-four ounces of the mercury, I made an amalgama, which I ground and waſhed as in the former preparations; and I repeated all the operations, laſt mentioned, ſeven times.

THE 1st of *December*. With two ounces of pure gold, one ounce and a half of fine ſilver, and with ten ounces of the ſaturnine mercury, I made an amalgama; and this I cleaned by grinding and waſhing, as I did the other ſolar amalgama: then I boiled in diſtilled vinegar, and waſhed it with warm water, and dried it firſt with clean linnen, then between white paper on the top of my athanor.

THE 6th. I divided it, and put it into two cryſtal eggs, which I ſealed hermetically.

THE ſame day. Having enough of my firſt ſophic mercury by me, I made another amalgama with two ounces of pure gold, and ſix ounces of that mercury, by grinding, waſhing, boiling, and drying. I prepared it as I had done the other, and alſo hermetically ſealed it in two eggs.

THE 11th. I placed my ſix eggs in my athanor, and gave them a gentle heat one and twenty days; then the laſt amalgama, with the firſt ſophic mercury (*i. e.* mercury in the ſecond experiment) and gold turned blackiſh; the next with mercury and gold was more like æs uſtum; the other with gold, ſilver, and ſaturnine mercury, was divided into little iſlands.

THE 21st. They were all divided into little iſlands.

THE 21st of *January*, 1677-8. They appeared like moſs and ſmall ſhrubs, differing ſomewhat in colour, *viz.* that with the philoſophic mercury and gold had ſpots and little lines of a pale gold colour: that with the mercury, prepared with regulus of mars and venus, more inclining to a red: that with the gold, ſilver, and mercury, with ſaturnine ſpots and lines. The vegetation viſibly increaſed for ten months, and from moſs to ſtems, to trees with leaves and fruit. I augmented the fire a little every month, till the trees ſeemed to wither; and about the twelfth month they ſhriveled into a ſubſtance like a dry red earth. However, I ſtill increaſed my fire, till

THE 4th of *March*, *A. D.* 1678-9. And then one of the eggs with the ſaturnine mercury, broke with a noiſe like a gun: this broke the neck of another, and cracked two more, with the windows of my athanor. Now I thought it high time to let the fire out. I ſcarce recovered any part of the broken egg; in the reſt I found ſome precipitate and a thick amalgama; but in the eggs with the gold, ſilver, and mercury, I had ſome little hard bits like block-tin. With a feather I carefully wiped out the precipitate from each egg. In the remaining egg with the ſaturnine mercury, I had two ounces, two ſcruples, and eight grains. In the eggs with the gold, ſilver, and mercury, I had four ounces and five drams. In the eggs, with the ſophic mercury, I had five ounces, one ſcruple, and ſeven grains. At firſt I would have perſuaded myſelf, that theſe precipitates far exceeded thoſe commonly made by corroſive menſtruums; but, after many trials, I was convinced that they were not better than thoſe made at a much cheaper rate. The amalgama of ſol and mercury, which I had left in three eggs, I put into a crucible, and ſet it in a melting furnace: but here again I was diſappointed; for the fire as eaſily evaporated my mercury, as if it had been virgin-mercury from the ſhops; and the gold (excepting what was loſt by the breaking of the egg) I had all juſt as pure as when I put it in. And thus I was ſatisfied, that, after this method, there could be no union of ſol and mercury; and this made me leſs regard thoſe gentlemen that deſpiſed the corroſive diſſolutions, eſpecially ſince I often revived ſol and luna, after they had been diſſolved in aqua regia and aqua fortis, and always found the noble metals as perfect as before.

Experiment IV.

THE 10th of *March*, *A. D.* 1687. I diſſolved four ounces of gold in a very well made aqua regia.

THE 11th. I diſtilled in a retort the aqua regia.

THE 12th. I returned this aqua regia, with four ounces more upon the gold in the retort, and again diſtilled it.

THESE diſſolutions, diſtillations, and cohobations, I repeated ſeven times, and then my gold looked like a pure red gum, which I kept for farther uſe. I put two pounds of fine ſpirit of ſalt, and twelve ounces of my mercury, (which I had kept ten years) prepared with regulus of mars and venus, into a retort; I diſtilled the ſpirit of ſalt from it, and raiſed a ſublimate, which was mixed with ſome globules of crude mercury. I ſwept the ſublimate from the neck and top of the retort, and waſhed it alſo out of the receiver, with half a pound of freſh ſpirit of ſalt, and diſtilled it again; and then I had a greater quantity of ſublimate, with ſome very ſmall globules of crude mercury. I ſwept and waſhed my retort and receiver with new ſpirit of ſalt, and diſtilled it the third time; when all the mercury roſe in a delicate ſpungy ſublimate, as white as ſnow, I broke the retort, (in the bottom I found ſome grey feces) and ſcraped, and waſhed the ſublimate into a clean glaſs body, and returned the ſpirit of ſalt upon it, which totally diſſolved it.

I put the ſolution into a retort the fourth time, and again diſtilled. The ſublimate roſe white and and pure, left but very few feces in the bottom, and thoſe brighter than the firſt.

ONCE more I returned the ſublimate and ſpirit into a glaſs body, and diſſolved it.

THE fifth time I put it into a clean retort, and diſtilled it again; and then all roſe clear, without leaving any feces.

I diſſolved the above-mentioned ſolar gum in aqua regia, and this fine ſublimate in new ſpirit of ſalt, and put both theſe diſſolutions into a retort, letting them ſtand four and twenty hours; then by a gentle ſand-heat I drew off the ſpirit without raiſing any ſublimate. I returned the ſpirit upon the gold and ſublimate, by which they were entirely diſſolved. I diſtilled as before, and this I five times repeated; and then I left the ſol and mercury at the bottom of the retort, of the conſiſtence of a thin, clear, red ſyrup.

THE 5th of *April*, *A. D.* 1688. I poured this ſolar ſyrup into a clean glaſs, and waſhed the retort with a little of the former drawn ſpirit; then I divided it, putting to the one part an ounce of thick aqua regia, made of mars and venus, and half a pound of pure rectified ſpirit of nitre; to the other part I only put the like quantity of the ſpirit of nitre, (I having firſt put the divided ſyrup into two retorts) the ſpirit turned them both muddy. I luted on the receivers, and by a gentle heat drew off eight or ten ounces of liquor from each, which I returned with four ounces of freſh ſpirit of nitre for each retort, and then drew off twelve or fourteen ounces. I cohobated the third time with four ounces of new ſpirit. I had no clear diſſolution in theſe three cohobations. The fourth time I returned the ſpirit with one pound of rectified ſpirit of venus into each retort; and having ſhaken them well, I luted on the receivers, and ſet them in warm ſand till next day, when, to my great ſatisfaction, I found a clear diſſolution. Then I made fire under them, and diſtilled about two thirds of the liquor, which I returned alſo with half a pound of freſh ſpirit of nitre upon each, and by a gentle heat drew off about one third of the weakeſt liquor, which I kept by itſelf. When the retorts were cold, I added half a pound of new ſpirit of nitre to each retort, and diſtilled almoſt to a dry bottom: that with the aqua regia of mars and venus, was of a deep red colour, the other a little paler.

THE 18th. I returned all my liquor, and drew it over again; and at the third cohobation I diſtilled the matter dry. I once more returned what diſtilled, and drew off about four ounces from each glaſs. When the retorts were cool, I added four ounces of new ſpirit of nitre to each, and let them ſtand in warm ſand till the next day, and then again I found a clear diſſolution.

THE 22d. I diſtilled to a dryneſs, and gave a ſtrong fire in ſand. When all was cool, I cut the retorts above the contents; in the necks I had ſome light flowers, which I ſeparated. The contents of the retort with ſol and mercury, were partly red and partly yellow. The other, with ſol, mercury, and the aqua re-

regia from mars and venus, was of a deep red. I put them again into freſh retorts, and returned the liquor I had drawn, adding to each retort four ounces of new ſpirit of nitre : I ſet them in warm ſand, and I had a clear diſſolution in twenty-four hours.

THE 27th. I drew off two thirds of the liquor, in which I diſſolved half a pound of the ſecret ſalt armoniac, made with ſpirit of ſalt and ſpirit of urine. After I had ſhaken and divided the diſſolution, I returned it into each retort, and let them ſtand till

The 29th. In the morning I made fire under them, and drew off about three fourths, which I cohobated.

THE 1st of *May*. I diſtilled to dryneſs, and ſublimated part of the ſalt armoniac, and waſhed it down into the retort with the diſtilled ſpirit. Then I ſublimated as much as I could with a ſtrong fire. When all was cold, I cautiouſly ſcraped the ſublimate into two jarr-glaſſes, and found it weighed eight ounces, and (almoſt) two drams. The ſublimate from the gold and mercury was very white; the other was browniſh, with ſmall purple and yellow lines. The gold and mercury which remained in the retort, was coloured like fine crocus metallorum, and very compact ; the other was of a deeper colour, inclining to a purple, but not ſo ſolid as the former.

THE 4th. I mixed (by grinding) each bottom with its proper ſublimate, and put them into retorts, and poured upon each, twelve ounces of very ſtrong rectified ſpirit of nitre: after they had ſtood twenty-four hours in warm ſand, they were diſtilled again, the ſalt armoniac ſublimated, which I ſwept down into the retorts, I diſtilled and cohobated three times. The laſt time I gave the ſtrongeſt fire. When all was cool, I carefully ſcraped off the ſublimate, and found it but ſix ounces, three drams, and a half.

THE 9th. I reduced each bottom into fine powder, which I put into large retorts, adding, gradually, two pounds of rectified ſpirit of wine into each retort: I ſet them in a ſand-heat, and fitted on two large receivers. Without any more heat, the ſpirit (as I expected) began to diſtill with violence and red fumes, as in the diſtillation of ſweet ſpirit of nitre.

THE 10th. I gradually put into each retort two pounds more of rectified ſpirit of wine, and diſtilled it. I repeated the operation a third time, and then it came over without any corroſive taſte or ſmell.

THE 14th. I again reduced each confection into fine powder, which I put into uncut bodies, and returned the laſt diſtilled ſpirit of wine upon them, and kept them all day in a ſimmering heat.

THE 15th. This morning I decanted the ſpirit of wine; that from the firſt body was of the colour of canary, and then had a little ſharp rough taſte. The ſpirit of wine from the ſol, mercury, and the aqua regia of mars and venus was deeply tinged, (which ſome raw chemiſt would take for aurum potabile) and of a rough vitriolic taſte. I put two pounds of freſh ſpirit of wine into each body, and boiled as before. That from the gold and mercury was not in the leaſt tinged; the other but very little, and was ſomewhat ſharp.

THE 17th. I boiled them with new ſpirit of wine; which, when cold, had no tincture, or acid taſte. I dried the confections, and cut the bodies low enough to take the powders clean out with a feather. That with the ſol and mercury weighed ſix ounces, three drams, and fourteen grains. The other with the ſol, mercury, and aqua regia of mars and venus, weighed ſeven ounces, one dram, and eight grains.

THE 19th. I put them into two cryſtal eggs, which I fitted with glaſs ſtoppers, and did not ſeal them hermetically. I placed them in my athanor, and kept a gentle heat, till

THE 1st of *June*. I could not perceive any alteration, till this day, when they began to vegetate with ſmall white lines. I kept them in my athanor four months, gradually increaſing my fire; and daily pleaſed myſelf with the various figures and colours, which were different from thoſe the former amalgamas (made without corroſives) afforded me; for now they vegetated with ſtrait lines, as ſmall as fine needles, up to the tops of the eggs, with little knobs at the end of each line, ſome red, others green, and others of a lovely yellow: they grew and withered four times, ſo that, I may ſay, they had four ſprings, and as many autumns; at laſt they ſtood ſmooth, and looked like melted metal.

THE 8th of *October*. I increaſed my fire to a full third degree, and ſo kept it till

THE 11th of *December*; When I was treated as the *Spaniſh* ambaſſador was: for the mob taking me for a conjurer, or ſomething worſe, broke my glaſſes and athanor; ſaying, I was preparing the devil's fire-works, purpoſely to burn the city and *Whitehall*. And thus ended this operation.

Experiment V.

THE 11th of *June*, *A. D.* 1694, I met with my old friend, who aſſured me, that at the laſt, after forty years ſearch, he had met with an ample recompence for all his trouble and expences. This he confirmed with ſome oaths and imprecations; but, conſidering his great weakneſs and age, he looked upon himſelf incapable to undergo the fatigue of the proceſs. "I have here (ſays he) "a piece of ſol that I made from ſilver about "four years paſt, and I cannot truſt any man but

" you with ſo rare a ſecret; we will ſhare equally
" the charges and profit, which will render us
" wealthy enough to command the world."

THEN he read the proceſs, which indeed did not ſeem unreaſonable to me, eſpecially ſince he offered at no peculiar advantage to himſelf. Thus I was perſuaded to put it upon the trial, and accordingly,

THE 21st. I beat twelve ounces of *Japan* copper into thin plates, and laid it ſtratum ſuper ſtratum, with three ounces of flowers of ſulphur in a crucible, which I placed in a melting furnace, with a gentle heat, till the ſulphureous flames expired. When cold, I pulverized the æs uſtum, and ſtratified again; and this I repeated five times.

THEN I put ſix pounds of iron-wire into a large glaſs body, and poured upon it twelve pounds of ſpirit of ſalt; it ſtood ſix days in a gentle heat, before it ceaſed from bubbling: then I decanted and filtred the liquor, and to the undiſſolved wire I put ſix pounds more of ſpirit of ſalt, which I let ſtand its due time, and then decanted and filtred it. I put both the liquors into a large retort, and by a ſand-heat drew it off; towards the latter end, (when the drops came yellow) I changed the receiver, and increaſed my fire to the higheſt degree, in which I kept it four or ſix hours. When all was cold, I took off the receiver, and found in the neck of the retort, a quantity of flowers variouſly coloured, like the rainbow. The yellow liquor in the receiver weighed ten ounces and a half; the flowers, two ounces and three drams. I put the liquor and flowers into a clean bottle.

I put alſo half a pound of ſal enixum, and a pound and a half of ſpirit of nitre into a retort, and let it ſtand till the ſalt was diſſolved; then I added ten ounces of mercury, which I had diſtilled through quick-lime and ſalt of tartar. I drew off the mixture to a dryneſs, and found a fine yellow maſs in the bottom of the retort. I returned the liquor with half a pound of freſh ſpirit of nitre, and diſtilled as before. I repeated it a third time, urging this laſt cohobation with the higheſt degree of fire. When all was cold, I found a various-coloured maſs in the bottom of the retort.

LASTLY. I diſſolved four ounces of fine ſilver in one pound of aqua fortis, and added four ounces of the æs uſtum; of the mercurial maſs, one ounce and a half; of the martial tincture, two ounces and a half. When they had ſtood together in a retort twenty-four hours, I decanted the liquor, and poured four ounces of new ſpirit of nitre upon a little matter that was not diſſolved. In the morning I had a total diſſolution.

THE 26th. I put all the diſſolution into a retort, and diſtilled it almoſt dry. I cohobated three times, urging the laſt with a very ſtrong fire, till no fumes appeared, and not a drop fell.

THE 28th. I put the matter left in the bottom of the retort, into a crucible, and gently evaporated all the corroſive fumes, and, with a fluxing powder, melted it down.

Now my friend expected five ounces of perfect ſol; but, upon examination, the luna was the ſame (only a half-penny weight worſe) as when I diſſolved it in aqua fortis. There were indeed ſome few grains among the ſcoria, which appeared like ſol, and would not diſſolve in aqua fortis.

Experiment VI.

NOtwithſtanding our ill ſucceſs in the laſt, my old friend preſſed hard for another experiment; ſaying, he was very poſitive we ſhould now ſucceed, if we added a little ſol to the former prepared mercury, mars, venus, and luna; beſides, he offered to be at the charges, and that I only ſhould be the careful operator. Accordingly, on

THE 11th of *February*, *A. D.* 1699, he brought me two drams of fine gold, which I diſſolved in aqua regia, and cohobated ſix times.

I diſſolved alſo two ounces of fine ſilver in half a pound of aqua fortis. To this diſſolution I put two ounces (he thinking there was too little in our laſt work) of the mercurial maſs, one ounce and a half of the martial tincture, and two ounces of the æs uſtum; and at laſt the afore-mentioned gold, (diſſolved in the aqua regia.) After they had ſtood a ſufficient time on warm ſand, I decanted them clear. The brown feces I ſuppoſed to be gold, but I ſoon diſſolved them in ſpirit of nitre, except a very little white matter, and decanted this diſſolution alſo.

THE 22d. I put the two diſſolutions into a retort, and drew off almoſt to a dry bottom: I cohobated ſix times, at laſt drawing all off to a dryneſs.

THE 28th. I put the ſubſtance left in the bottom of my retort into a crucible, proceeding as in the former proceſs, and melted it with a fluxing powder, and poured it into an ingot mould; when it was cold, I turned out the ingot, and beat off the ſcoria.

THE ingot was a little tinged, and the ſcoria had ſome grains of metal much like gold.

I reduced the ſcoria into powder, and, by frequent waſhing, ſeparated the yellow metallic particles, which weighed one dram and eight grains; and theſe ſtood the teſt of aqua fortis.

I beat the ingot into thin lamels, and diſſolved them in aqua fortis, to ſeparate the luna from the ſol; and here I found one dram, two ſcruples, and five grains of gold.

I alſo ſeparated the luna from the aqua fortis, by the help of venus, and had one ounce, ſix drams, one ſcruple, and three grains of ſilver.

So I loſt one dram, one ſcruple, and ſeventeen grains of ſilver, and gained two ſcruples and thirteen grains of gold.

BUT, conſidering the trouble and expence of the experiment, I believe the reader will agree with me, that this gold was bought too dear.

Experiment VII.

THE 21st of *Auguſt*, *A. D.* 1704. I diſſolved two ounces of fine ſilver in a particular aqua fortis. I diſſolved and cohobated ſeven times, and then the luna remained in the bottom of the retort, like a tranſparent yellow gum.

WITH the aqua fortis I had drawn off, I diſſolved one ounce of *Japan* copper.

I alſo diſſolved one ounce of the mercury (prepared with ſal enixum) with half an ounce of the tinctura regalis of flowers of mars.

I drew the water from the mars and venus, and cohobated five times; and then I had a deep red gum with a greeniſh reflection.

I diſſolved both the gums in their proper menſtruums, which I had drawn from them, and put theſe diſſolutions, and that of the mercury together, and ſet them in a ſand-furnace. I diſtilled the ſpirit, returned it, and cohobated three times; I gave it a ſtrong fire the laſt time, which raiſed ſome flowers. I found in the retort five ounces and one dram of a red ſubſtance, a little ſpongy, and almoſt tranſparent.

THE 16th of *September*. I beat it to a groſs powder, and put it into a crucible. I let it ſtand about an hour in a gentle heat to evaporate the corroſive ſpirits. When it was cold, I mixed it with a little ſoap, borax, and nitre, and with a ſtrong fire I made all haſte to melt it, and poured it into an ingot mould. I found it weighed two ounces, ſeven drams, and four grains: the colour of it was between ſol and venus, which pleaſed me extremely; but my ſatisfaction did not laſt long, for the metal was not malleable, neither would it ſtand the teſt of aqua fortis; but on the contrary it readily diſſolved, tinging the aqua fortis a little blue: I cupelled ſome part of it, and had good ſilver again.

THESE and many more experiments I have made, and always fell ſhort of, or was entirely baffled in my expectations.

I obſerve phyſicians are well pleaſed with the integrity of that author, who relates caſes wherein he had not his deſired ſucceſs: ſo I hope the reader will pardon and credit me, ſince, by faithfully diſcovering my own diſappointments and miſcarriages, I have ſhewed him how to avoid the like.

ADDITIONS

TO THE

APPENDIX,

By Way of NOTE.

[*Exp.* I. *p.* 407.] "THE poſſibility of converting mercury into water, or at leaſt of obtaining a great quantity of water from mercury, has not only been believed by ſeveral great men in the chemical art, but ſome have even ventured to aſſert, that they have actually effected this change. Yet nevertheleſs, they have delivered the hiſtory of this affair with ſuch marks, as ſeem to make the reality of the change extremely doubtful. Mr. *Boyle* (in his tract *of the producibleneſs of chemical principles*, annexed to *Scept. chymiſt*, p. 235.) ſays, that he "once ob-" tained water from mercury without additament, "without being able to make the like experiment

" afterwards ſucceed." Mr. *Le Febure*, who is generally looked upon as an honeſt practitioner, directs a proceſs ſimilar to that above, for the obtaining of this mercurial water. But it is to be ſuſpected, as Mr. *Hales* very well obſerves, (in his *Statical Experiments*, p. 200.) that Mr. *Boyle*, and others, were deceived by ſome unheeded circumſtance, when they thought they obtained a water from mercury, which ſhould ſeem rather to have ariſen from the lute, and earthen veſſels, made uſe of in the diſtillation; for Mr. *Hales* could not find the leaſt ſign of any moiſture, upon diſtilling mercury in a retort made of an iron gun-barrel, with an intenſe degree of heat, although he frequently cohobated the mercury, which came over into the recipient. In a courſe of chemical experiments, I repeated Mr. *Hales*'s proceſs, and urged the mercury (which was let fall by little and little through an aperture made in the gun-barrel for that purpoſe) with a moſt intenſe degree of heat, without obtaining any water: but it being ſuſpected by a bye-ſtander, that the mercury in this experiment came over before it had been ſufficiently acted upon by the fire, by reaſon of the lowneſs of the neck of the diſtilling inſtrument, the experiment was varied in the following manner. Sixteen ounces of mercury were heated in a crucible, in order to evaporate any moiſture that might have been accidentally mixed with it; and an iron gun-barrel, of four feet in length, being placed perpendicularly in a good furnace, and a glaſs head and a recipient fitted to its upper part, the mercury was let fall by little and little into the barrel, and the fire urged with bellows: after each injection, the mercury made a conſiderable noiſe and ebullition, and aroſe in fumes into the head, where it ſoon condenſed, and trickled, in the common form of running mercury, into the recipient, without the leaſt perceptible appearance of any aqueous humidity."

[*Exp.* I. *p.* 411.] "THE ſilver here ſeems to have been employed as a medium to unite the mercury to the regulus of antimony, to which this mineral has been generally looked upon as very repugnant. But this union may be made to ſucceed in a more perfect manner, by pouring a little quantity of regulus, when juſt melted, in a ſmall ſtream, into a conſiderable portion of mercury made almoſt boiling hot. *Henckel* [a] gives another method of making this amalgama: he directs mercury to be put into an iron mortar, along with ſome water, and ſet over the fire; when the water boils, a third or fourth part of melted regulus is to be poured in, and the maſs ground with a peſtle, till the amalgama is completed. The uſe of the water is to prevent the avolation of the mercury by the heat of the regulus; but as the two are by this means not put together in ſo hot a ſtate, the union is more difficult, and leſs perfect: the loſs of the mercury in the firſt proceſs may be prevented, by uſing a large veſſel, and covering it with a perforated iron plate, through the hole in which the regulus is to be poured.

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[a] *Medior. chymicor. non ultimum, conjunctionis primum appropriatio, jam in argento cum acido ſal. com. combinatione, experimento novo, invenit* J. Frid. Henckel.

IT may not be here amiſs to add a facile method of amalgamating copper, which according to the uſual proceſſes will not ſucceed, and which ſome chemical writers look upon as extremely difficult. Diſſolve ſome fine copper in aqua fortis: when the menſtruum will take up no more of the metal, pour it into an iron mortar, and add ſix times the weight of the copper, of mercury, and a little common ſalt: grind the whole well together with an iron peſtle; and in a little time, the copper will be imbibed by the mercury, and an amalgama formed, which may be rendered bright by waſhing it well with repeated affuſions of water.——*Another Method.* Take the muddy ſubſtance which is procured in the poliſhing of copper plates with a pumice-ſtone, and grind it well with a ſuitable portion of mercury, a little common ſalt, and ſome vinegar, in an iron mortar, (a marble one will do, if you make uſe of an iron peſtle) till you perceive the mercury has taken up the copper.——Theſe two bodies may likewiſe be united together, in the common way in which mercury is united with lead, *&c.* by pouring a little quantity of melted copper, through a perforated iron plate, in a ſmall ſtream, into a large portion of mercury, as is above mentioned of regulus of antimony.

FINIS.

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